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Model Engineer

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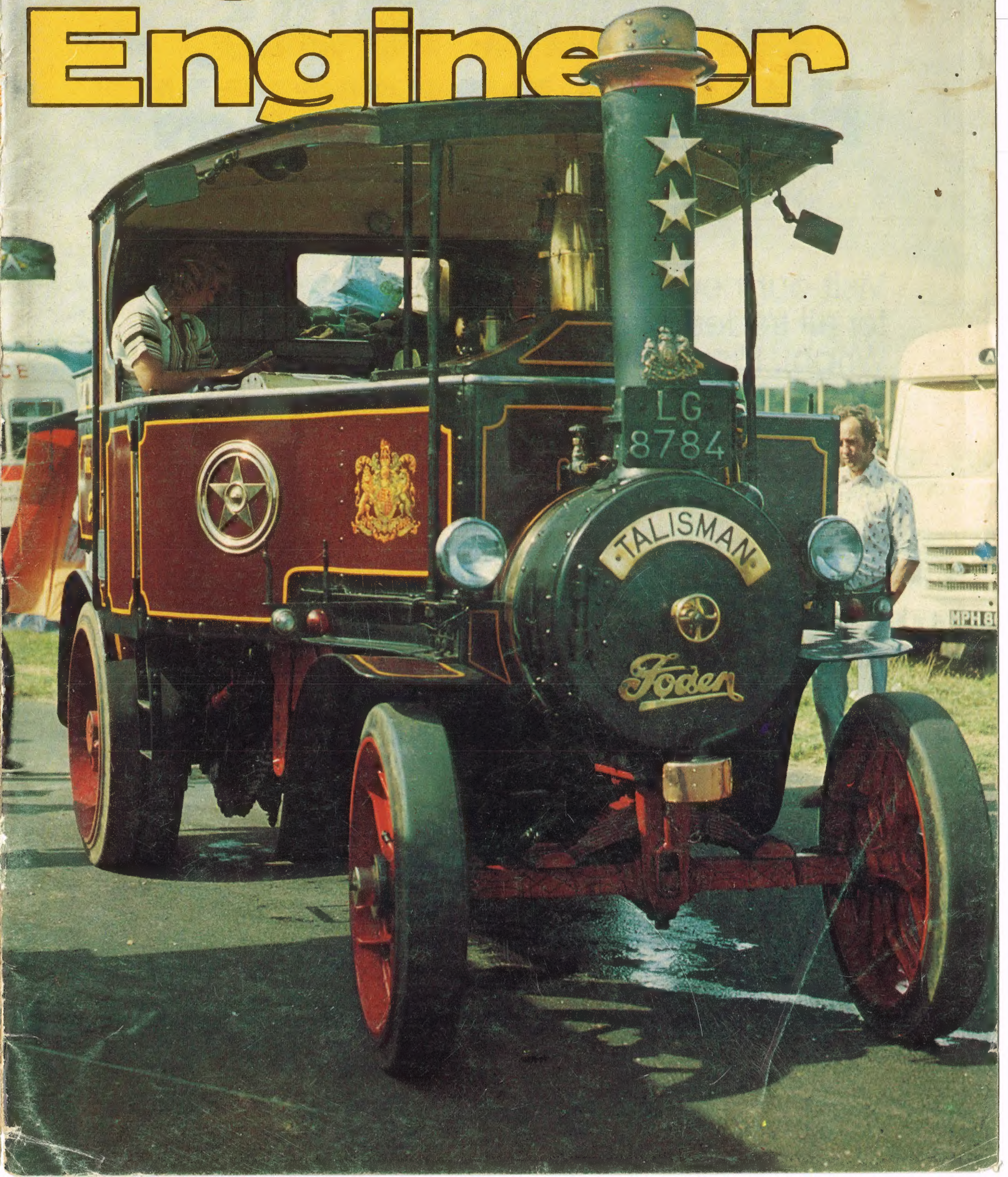

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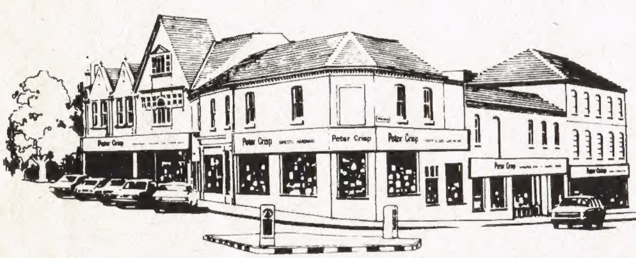

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NEXT ISSUE

A Clock Case by Claude Reeve

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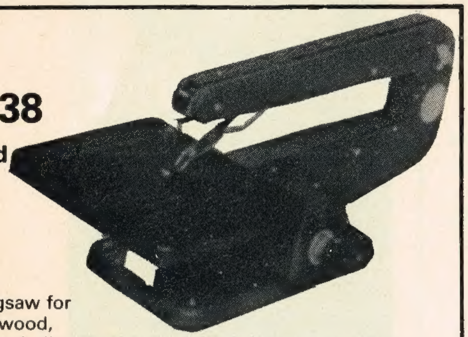

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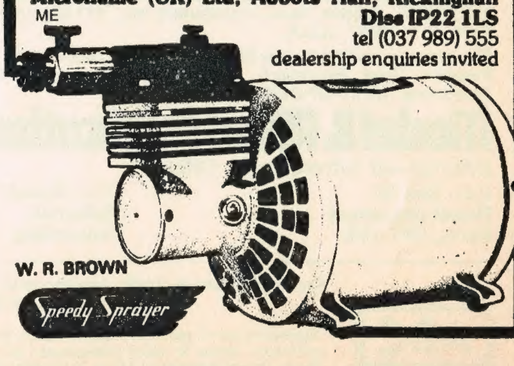

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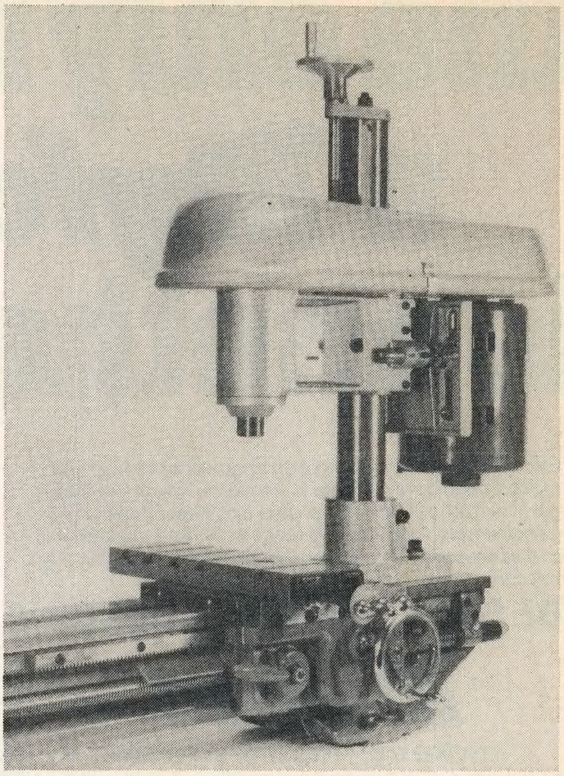

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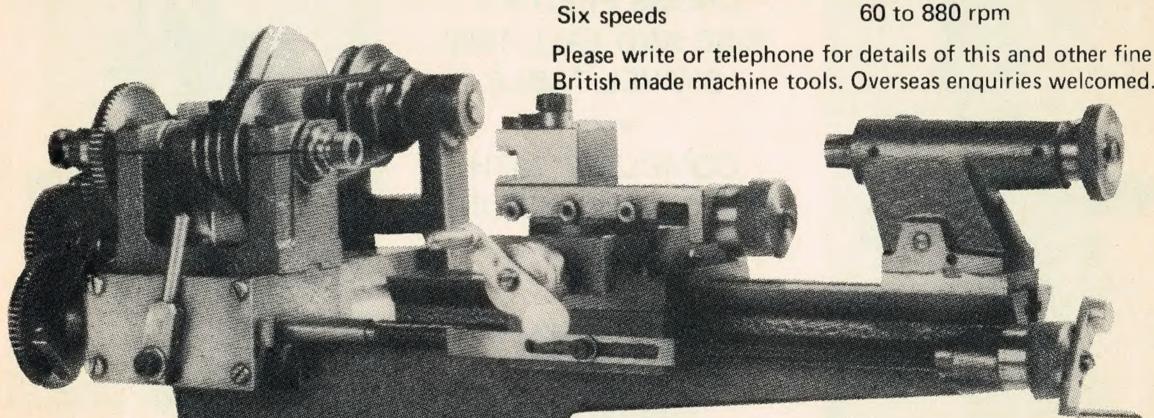

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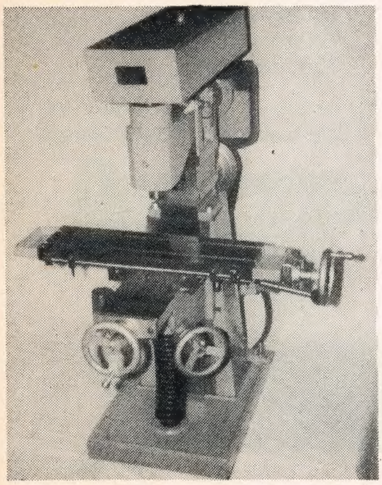

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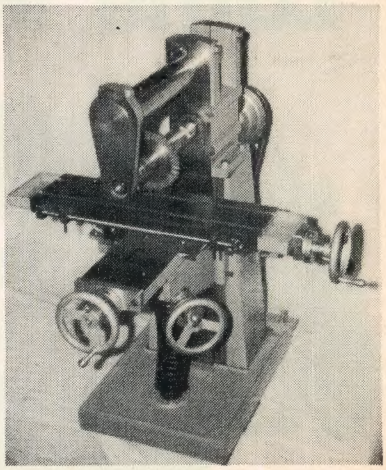

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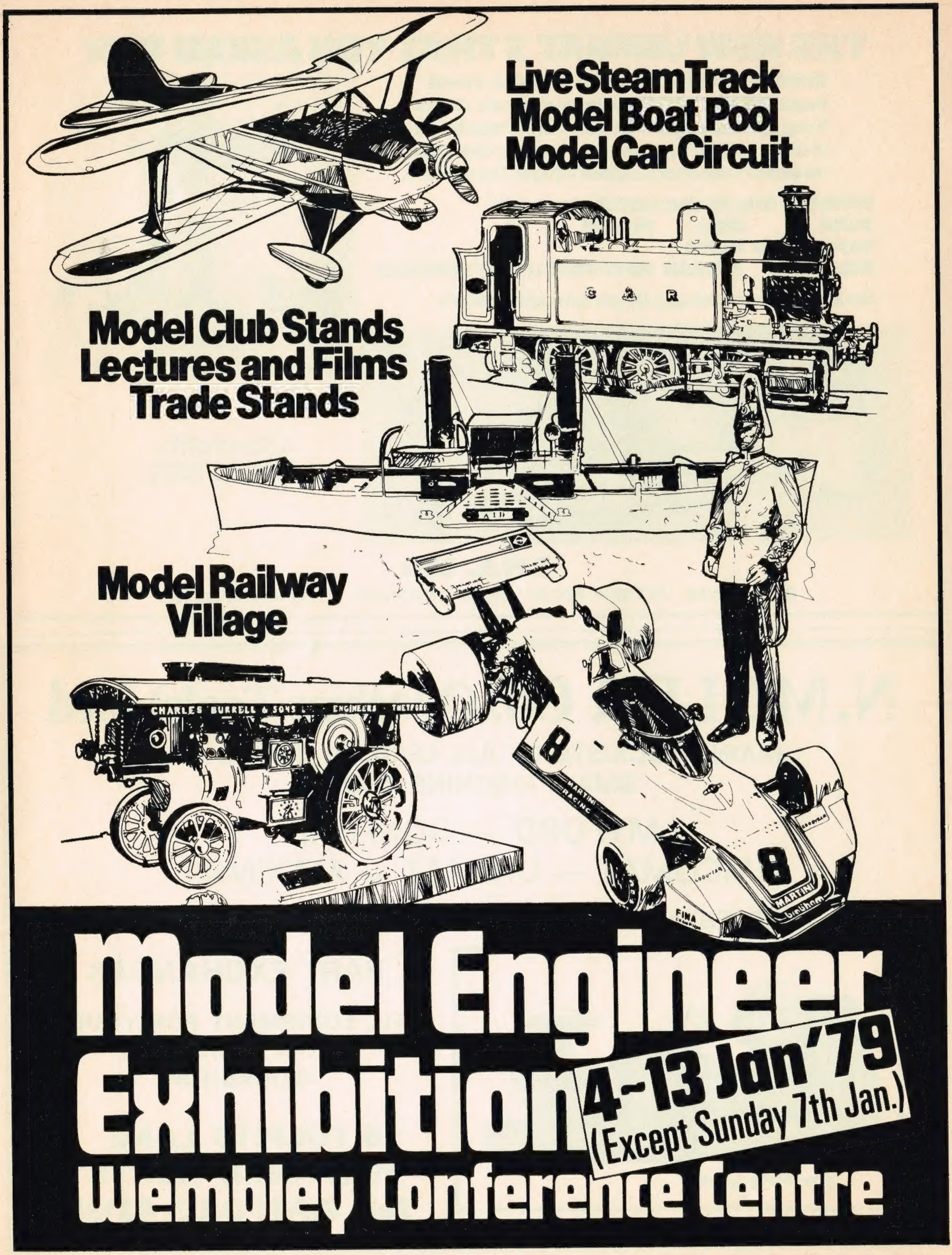
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SMOKE RINGS

A Commentary by the Editor

Next year's IMLEC

Confirmation has arrived from the Bristol club to the effect that IMLEC next year will be held in that city, probably over the weekend of 7/8 July. From this you will realise that the Bristol boys are in favour of a two-day event although I am aware that among our readers there are a few against the proposal. The success of this occasion will, therefore, serve as a pointer to future IMLECs. There is a lot of work to be done. At the time of writing I have not had discussions with the club and further news will be published as available. It is fairly certain, though, that 3½ in. locos will have a separate contest to the 5 in. and I hope this will encourage more of this gauge whose owners have perhaps been reluctant to enter because of the impression that they don't stand much chance of winning. This is just a preliminary announcement and as soon as possible I will let you have more details.

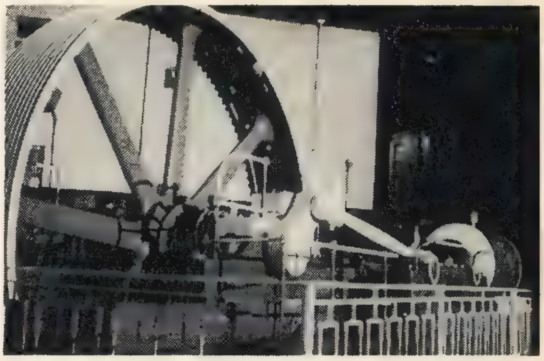
From the Past: The London and Rochester Trading Company's barge "Dreadnought" in the Estuary off Southend. Photo Jim King.

Swedish Centenary

I have recently heard from Gunnar Högberg, a reader from Sweden whose name has appeared on occasions in these pages. He has informed me that the little town of Bollnäs, about ten miles from Mr. Högberg's home in Vallsta, is celebrating the hundredth anniversary of the time when the northern Swedish main railway reached the town. To commemorate the event, special stamps have been printed showing pictures of the old locos in service at that time.

Mill engines

The current article by Alan Haworth on a large mill engine model appears to have sparked off a reaction throughout the country and I have received several photographs from readers of various installations which are either still working, up for sale, or now part of history. This one comes from Mr. D. Stead of Moston, Manchester, and is of the India Mill at Darwen, Lancashire. It was built by John Edward Wood of Bolton in 1905 and commissioned on 12 May 1906. Developing 450 h.p. at 75 r.p.m., the compound engine operated 1224 looms, 8 tape machines and a 65 kW d.c. generator. Working at 125 p.s.i., the high pressure cylinder was 19 in. bore and the low 32 inch. Stroke was 42 inches. The flywheel diameter was 15 feet and it weighed just over eight tons. Alas, the engine became obsolete in 1970.



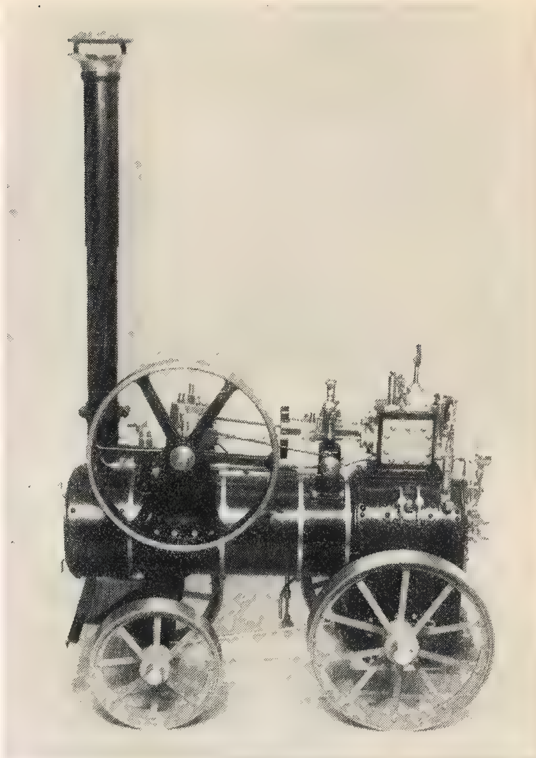
Some wheels keep turning

Big engines can, of course, be seen working under steam at Kew Bridge Engines Trust on Saturdays and Sundays from 11 a.m. until just after 5 p.m. Here the oldest engine goes back to 1820 when they were used to pump London's water supply. However, like Brighton Engineerium, Kew Bridge does not confine itself to stationary engines and work is carried out on other steam powered machinery, notably traction engines. Such a vehicle is *Eileen*, a 1919 Wallis and Steevens traction engine which has recently been acquired by Ray Osborne of Chadwell Place, Grays, Essex and which has had a going over at Kew Bridge before being delivered to the new owner. A new firebox was supplied by J. Hickey Ltd., the Richmond boiler makers. *Eileen* was delivered to Mr. Osborne on 21 September, having travelled overnight from Kew Bridge to Chadwell St. Mary under steam. Traction engine enthusiasts will know her for her race in 1951 against Arthur Napper's *Old Timer* — an event which resulted in the popular traction engine rally movement we know today.

THE MARSHALL PORTABLE ENGINE

by Ron Kibbey

Part XVII *From page 1133*



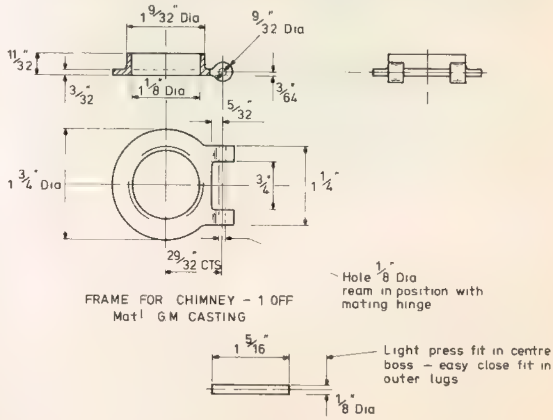
THE SMOKEBOX DOOR is made from 14 s.w.g. (.080 in.) flat sheet and I have called for this to be either b.m.s. or hard brass. It is fitted with two 5/32 in. bore bushes to take the locking handles, whether these are steel or brass/bronze depends on the choice of material for the door.

The hinges are produced by a method I have found very neat and satisfactory for locomotive doors. The hinge strip is a tight fit in a slot milled or filed across the boss, and a good fillet of silver solder run in. Some care will be required when positioning the hinge pillars on the front ring, there is not a lot of the front ring exposed when the door is in position, and it has been necessary to trim down the pillar adjacent to the flange.

I had no information from Bill Hughes for the shape or type of door locking plate or latch, and the locking plate I have called for is the way I resolved it for my engine. It certainly works most effectively, and since it is an internal fitting it is perhaps not too important if it is totally contrary to accepted practice. Any builder with knowledge of the original design will, no doubt, follow this. A word about the handles for the door locks. I used stainless steel for these, which I feel is the preferable material for such parts. There are also a lot more of this type of handle on the engine — 10 in all — most of which must be in stainless steel anyway because of contact with steam or water.

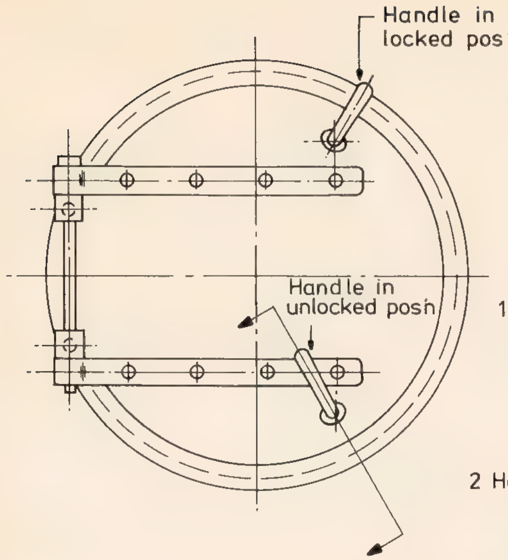
The only way I have found to satisfactorily bend the handle almost 90° is to do this whilst heated at least to dull red. It is also necessary to make a slave bush to put on to the shank of the handle which can be held in the vice or suitable fixture whilst the handle is bent. In the case of the plug valves which have this type of handle, the slave bush should have a taper reamed bore to match the taper in the valve body. By nutting the handle into such a bush, there is no danger of bending or damaging the taper portion.

The chimney is produced by two lengths of mild steel tube. The lower portion is 1⅛ in. outside dia. 16 s.w.g., the upper portion 1¼ in. outside dia. 16 s.w.g. I obtained my material from a local commer-

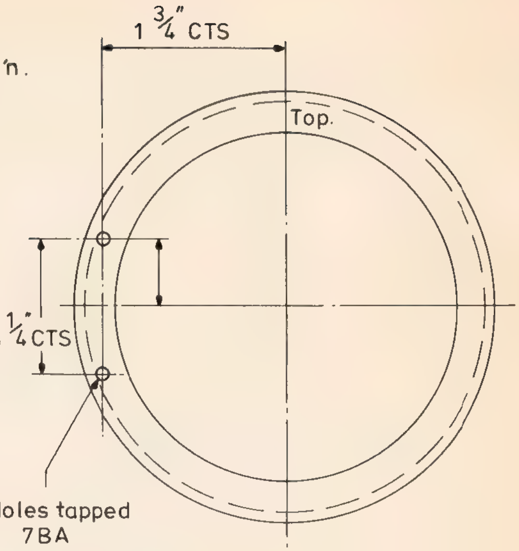


FRAME FOR CHIMNEY – 1 OFF
Mat'l G.M CASTING

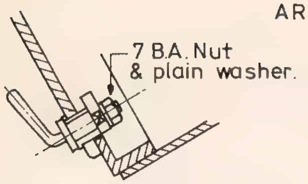
HINGE PIN
1 OFF
Mat'l – Stainless steel



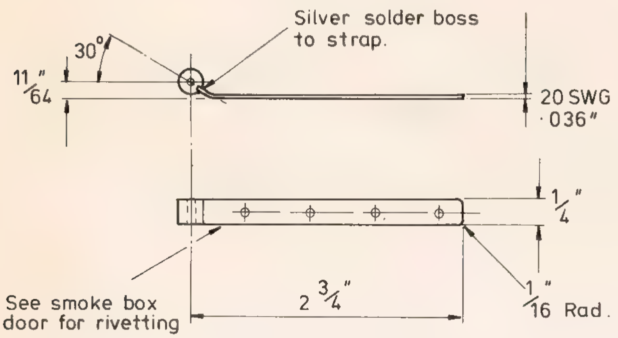
ARRGT. SMOKE BOX DOOR



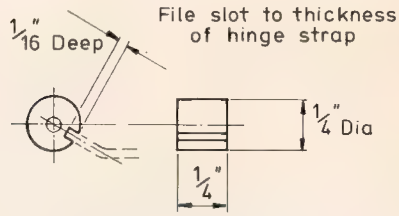
VIEW OF FRONT OF DOOR RING.



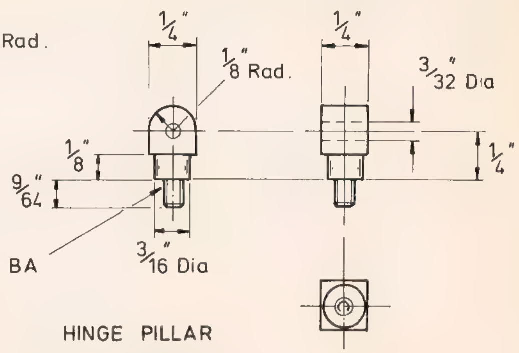
Section thro: locking handle.



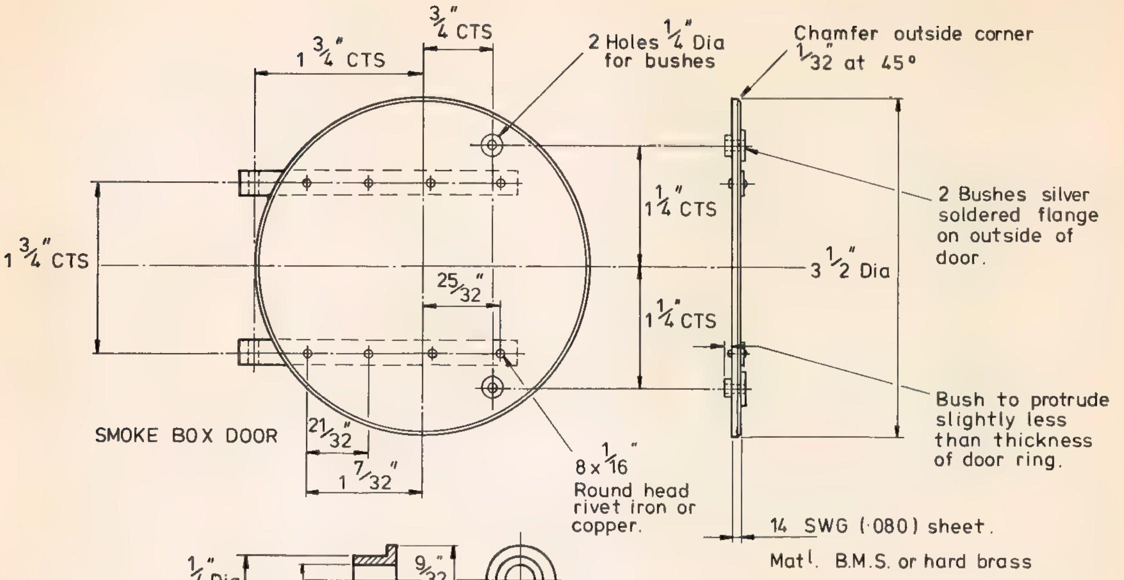
HINGE – SMOKE BOX DOOR
2 OFF – Mat^l. STAINLESS STEEL OR HARD BRASS

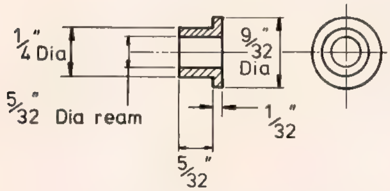


BOSS – HINGE STRAP
2 OFF – STAINLESS STEEL OR BRONZE.

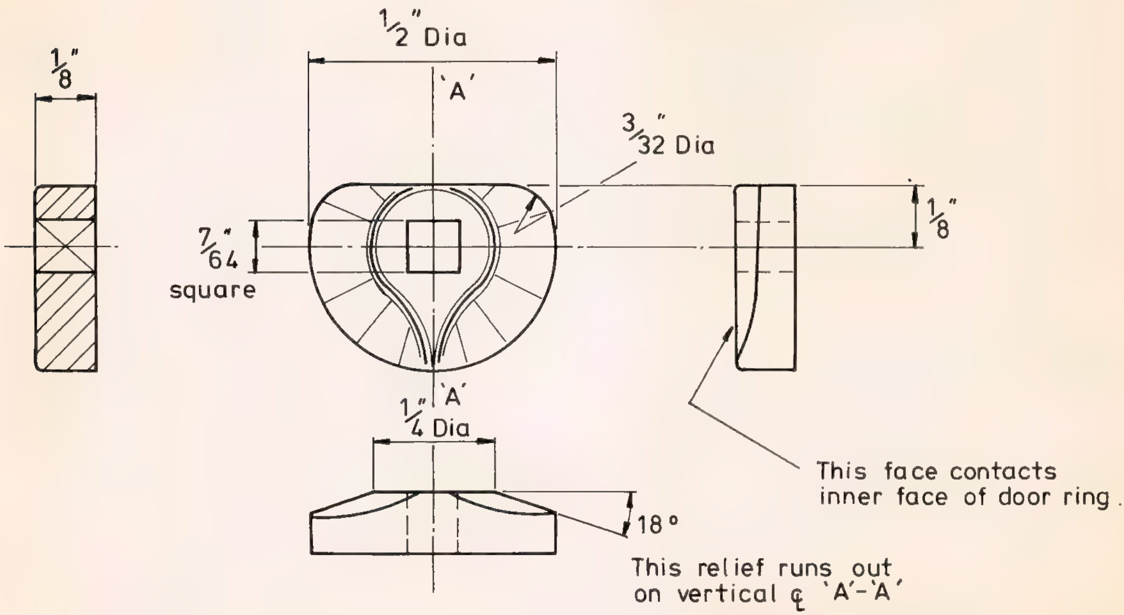


HINGE PILLAR
2 OFF.
Mat^l. Stainless steel or Bronze.

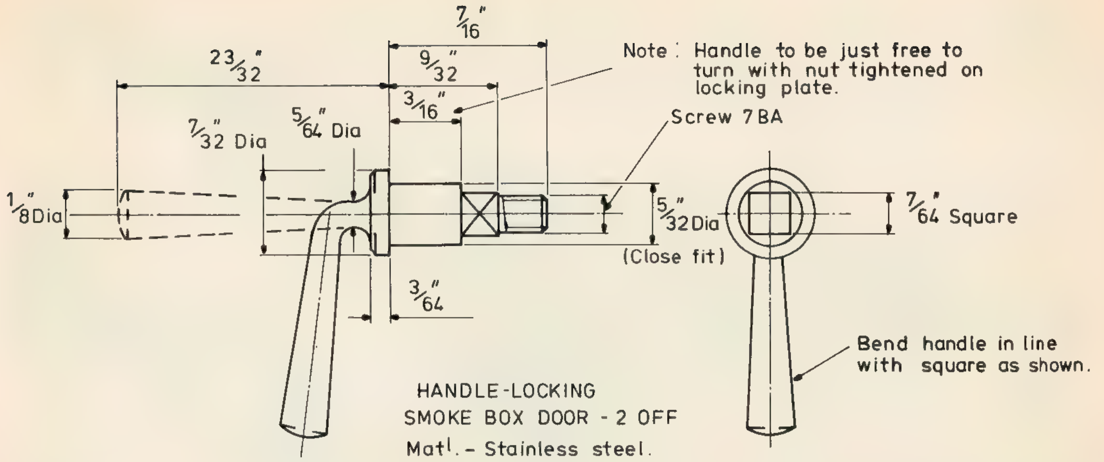




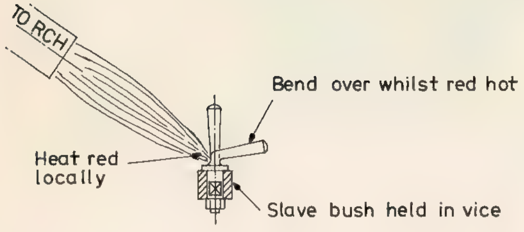
BUSH - LOCKING HANDLE – 2 OFF
Mat^l. - Stainless steel M.S. Brass or Bronze.



LOCKING PLATE
SMOKE BOX DOOR
No. OFF 2. Mat^l. Stainless steel.



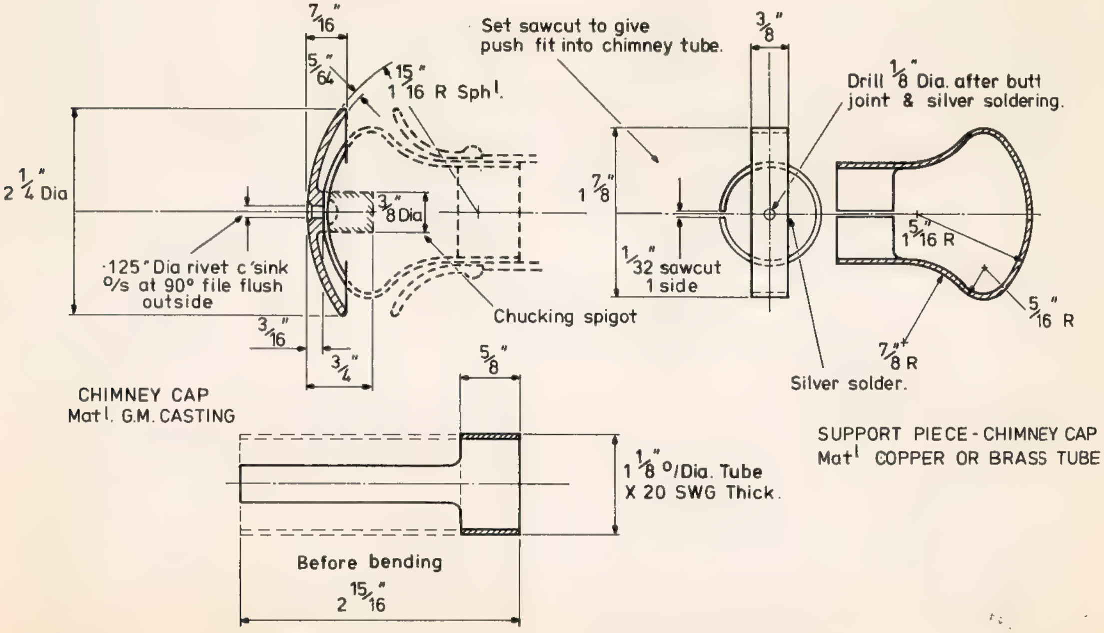
HANDLE-LOCKING
SMOKE BOX DOOR - 2 OFF
Mat^l. - Stainless steel.



cial steel stockist and these sizes are readily obtainable. The tubing is of the seam welded type, and the two sizes fitted very closely together after cleaning up the seam weld in the bore of the larger tube for about an inch. Reeves have produced castings for the chimney top and the cap, and also for the hinge flange.

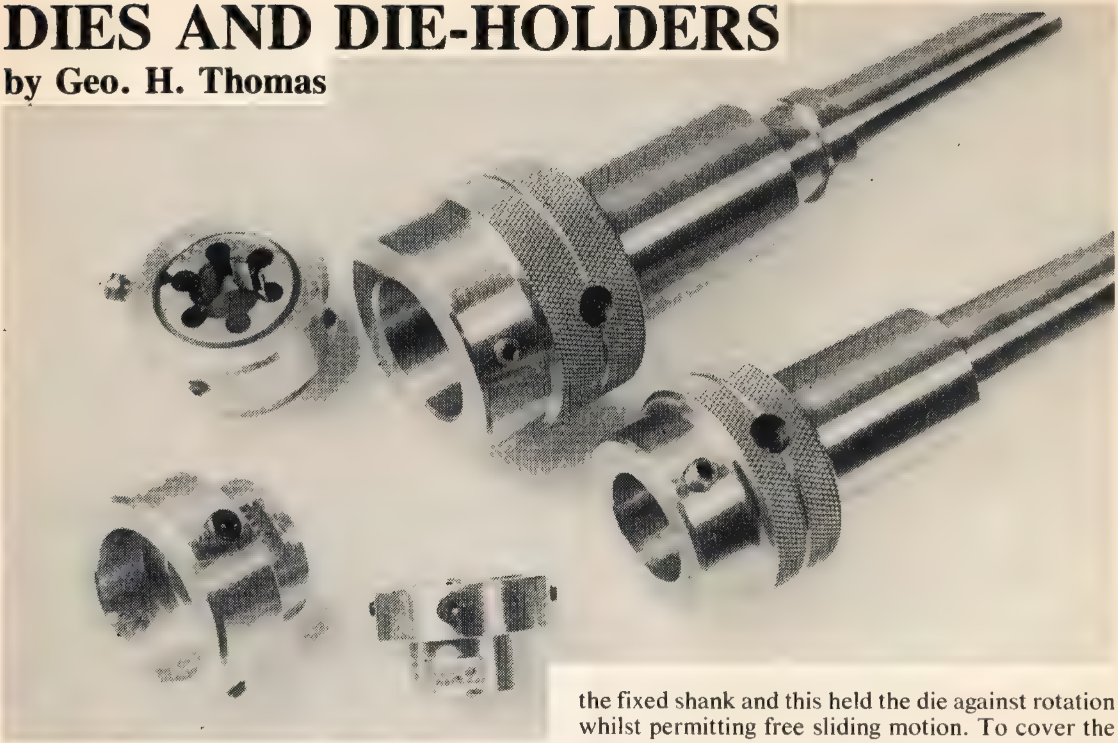
The method of securing the chimney cap to the chimney is yet another feature of which I had no details, other than what shows on Bill's general arrangement drawing.

Having discussed this with fellow model engineers at the local club, a suggestion that this ought to be detachable to facilitate cleaning soot from the chimney appealed to me. I therefore designed a type of spring clip which, although simulating the general arrangement drawing shape, is only held in by the spring fit of the support piece into the chimney bore. *To be continued*



DIES AND DIE-HOLDERS

by Geo. H. Thomas



SCREWING DIES are the means most often used for the production of male threads and the form most commonly used in the home workshop is the circular split die which, typically, has no inbuilt means of adjustment. At one time, dies were almost inseparably associated with "stocks" in which they were held and presented to the work with little or no positive guidance. I have to confess that I can find very little use for a die-stock which is best reserved for the odd spot of "garden engineering" where its use cannot always be avoided.

Dies are made to standard external dimensions: 5/8 in., 13/16 in., 1 in., 1 5/16 in., etc. (although 5/8 in. is no longer a recommended BS size); the sizes in commonest use by model engineers being 13/16 in. and 1 in. which can cover everything from 16 BA to 1/2 in. x 40. Coarser threads from 3/8 in. to 1/2 in. dia. use the 1 5/16 in. size. 3/8 in. and 1/2 in. BSF and, more especially Whitworth threads require the application of considerable torque when they are cut on to steel rods, generally far more than can be transmitted through a 4 in. S.C. chuck so if a piece of, say, 1/2 in. rod turns in the chuck instead of in the die don't overtighten the chuck which will probably ruin it for accurate work but use a four-jaw independent chuck which has far more gripping power or, better, screw-cut it.

For many years in the past I used a tailstock die-holder of my own contriving in which the sliding member had a key which engaged a keyway in the fixed shank and this held the die against rotation whilst permitting free sliding motion. To cover the assortment of dies of various sizes, the sliding member was made to carry a series of adaptors, one or more for each size of die up to 1½ in.

In the course of time I became very disenchanted with adjustable split dies which had to be set to the correct size every time they were used — it never seemed to happen that the die required to be used was the same one as last time — and so a lot of time was wasted in cut-and-try adjustments which should have been carried out on odd scraps of material, always provided that one remembered to do this before turning the component in hand. If the die had not been adjusted beforehand there was a very good chance of spoiling the work.

Things remained thus until I bought a set of 5/8 in. dia. BA dies from Whiston at fifteen shillings for eleven dies running from 2 BA to 14 (less 11 and 13). I faked up some kind of holder and tried out a few of them which cut excellent threads, so I ordered another set for spares. Something had now to be made to hold them as my other die-holder was altogether too large and insensitive for the smaller BA threads. The outfit shown in the photos was the outcome. Whilst I was about it I made a holder for every die and slightly larger ones for 11, 13, 15 and 16 of which I had the 13/16 in. size dies. Fig. 1 gives details of all the parts for this outfit which is housed in a cigar-box suitably fitted for the purpose, but there is room for only one of the 13/16 in. holders. The items drawn are: (1) Fixed shank or stem on which slides (7) which, in turn, carries at its

outer end the individual die-holder (6) for 5/8 in. dies or (5) for 13/16 in. dies.

The sliding body has a hardened stub on which the die-holders are pushed and fixed with a 4 BA grub-screw. Each die-holder is provided with four screws for holding the die, one of which has a pointed end to engage the slit in the die while the other three are 'jacking' screws which are used for centralising the die in the holder. Shown in Fig. 1 are also a tap-holder (2), a tap collet (3) and a tapping depth-stop (4), all of which will be described later.

Some, but not all, dies have dimples or vee grooves in their edges and these are usually located at the centre of the thickness of the die. The dimensions given on the drawings will result in the screws being a little nearer the bottom of the recess than half the die thickness, the effect of which, if the screw meets a dimple or groove, would be to hold the die down into the recess.

I was very pleased with the sensitive feel when cutting small diameter threads under power and the facility for spinning the die off the work without reversing the motor. When cutting larger threads — say 2 BA — on steel, the body needed to be gripped a little too tightly for comfort and so a 3/16 in. hole for a tommy bar was drilled into the knurled portion. This can be seen in the photos but is not indicated on the drawing.

The advantages gained from having all the BA dies pre-set and ready for immediate use were so great that it was decided to mount most of the other dies in individual holders and to make sliding carriers of appropriate sizes for the 13/16 in. and 1 in. dies. Fully dimensioned drawings of these are given in Fig. 2 and 3 and the complete outfits are shown housed in their sliding tray which fits into a drawer in the workshop. Some workers might, quite reasonably, feel that the two different holders are unnecessary and for these I have shown, in Fig. 2, individual mountings for both 13/16 in. and 1 in. dies (items 3 and 2 respectively) to fit the smaller of the two holders. So far as the small BA sizes are concerned, however, I would strongly recommend the outfit shown in Fig. 1.

Unfortunately, dies, like some human beings, are occasionally subject to various faults or imperfections such as drunkenness or eccentricity. The former is shown up clearly if the die is run in the lathe while being carried on a true running screw-thread; the die will wobble due to the out-of-squareness of the threaded bore in relation to the

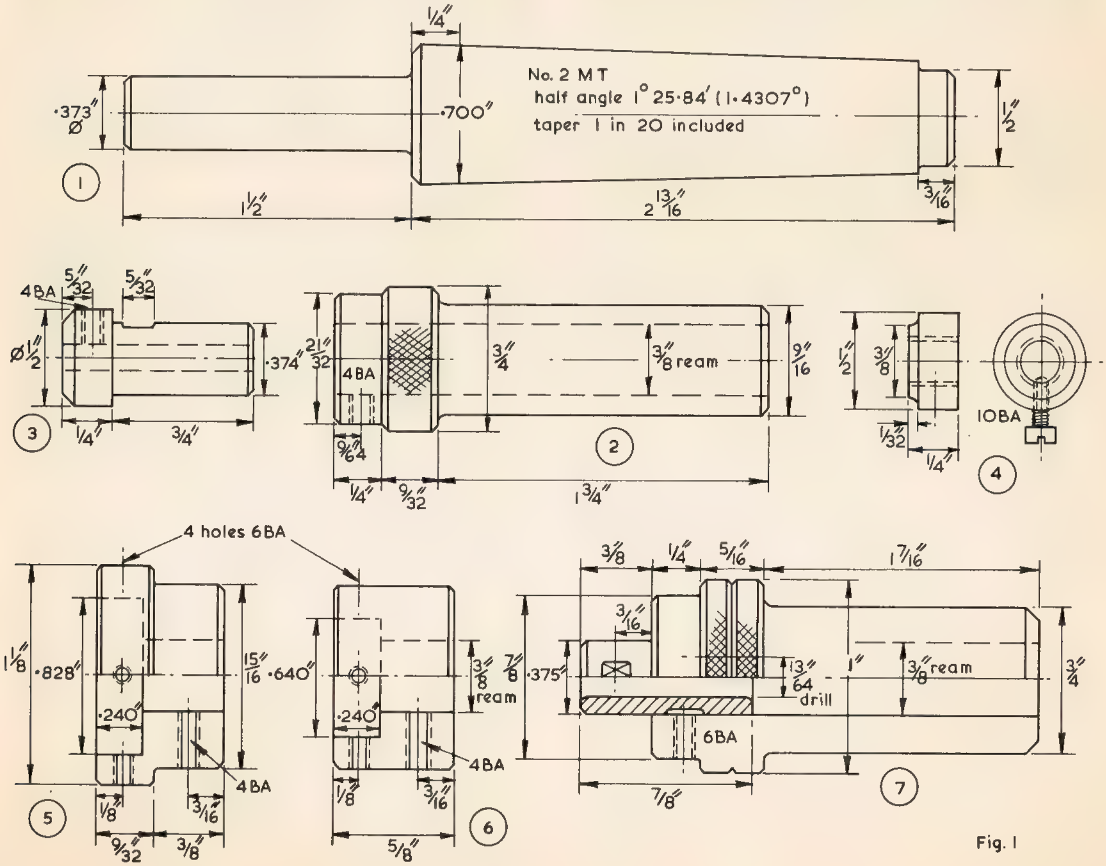
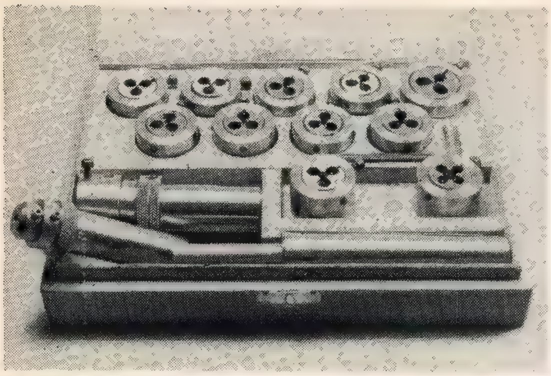


Fig. 1



Small die set with pre-set 5/8 in. dies.

die-blank. One might think that this could not happen, but it can! The cure for this is to return it to the supplier or the maker — it is useless.

Eccentricity can, within reason, be compensated for. Some dies are, in the relaxed state, undersize and have to be opened up in the holder; others, again, might be oversize and need to be closed down. All the die-holders shown in the drawings are made with recesses about 15 thou larger than the nominal size of the die which should be +.000, −.005 in., and this provides a little space for centralizing movements through the four holding screws. I hasten to add that nothing serious is likely to happen should the die be a small amount off centre because there is an allowance for a certain amount of float between the bore of the body and the shank where there is about three thou diametral slack which will be multiplied somewhat at the die.

I once had difficulty with a die for 7/16 in. or ½ in. × 40 t.p.i. which was cutting a thread with a step in the flank. Examination of the die showed that the trouble was caused by its not being bedded down properly into its recess. The action of tightening the conical ended screw in the slit lifted one side of the gap and forced the other side down (there were no dimples). The size of thread cut by the die was sufficiently large for this displacement across the gap to put the cutting edges out of correct pitch relationship. The trouble was cured immediately by tapping the die down into the recess. It is most unlikely that this trouble will be experienced with threads which are small in relation to the die size but when the thread diameter is near to one half of the die size the die becomes very springy and is easily distorted in the manner I have mentioned.

Setting to size. This raises the question "How do we know the correct size when we get it?" In industrial practice the correct size would be stipulated; the work would have to comply with certain established standards and tolerances and the checking would entail the use of much expensive equipment. For our purposes, however, I think that it could be fairly stated that the "correct" size is such as will be a nice, close fit in a hole tapped with our tap and provided this condition is met we are not very much concerned with any of the actual physical dimensions of the parts. When I say "our purposes" I have in mind readers who make parts to fit other parts made by themselves, but those readers who are involved in commercial work will be obliged to use commercial methods and acquire the necessary gauging gear.

In order to meet "our purposes" I have made a fairly complete set of thread gauges which, though primitive, fulfil their purpose to my satisfaction — and who else is really involved? As male threads produced in the lathe, either from a die or screwcutting, usually have to fit a tapped hole, I use a gauge which is nothing more than a disc of steel with a knurled edge (optional) and having a central hole carefully tapped with *my* tap. These gauges are typically 1/2 in. to 3/4 in. dia. and 1/8 in. to 1/4 in. thick and they cover the range 2-10 BA; 3/32 in. to 3/8 in. × 60; 1/8 in. to 1/2 in. × 40; and 5/32. to 1/2 in. × 32. They are made of FCMS and are left soft and have proved to be perfectly satisfactory as I treat them gently and don't try to force them on the work.

When a die is being adjusted to size it is customary to set it — by guesswork — somewhat on the large side and to take further cuts as it is closed down. Before you accept that the die is correctly adjusted it should be made to produce a fresh testpiece *in one cut only* which will probably differ in size from one which has been produced by more than one pass.

When tapping is carried out in the lathe it is customary to grip the tap in a drill-chuck carried by the tailstock which is left free to slide along the bed. This is not very good when cutting small BA or smallish fine threads as the tap has to drag the tailstock along the bed and then, on reversal, push it back again. To mitigate any ill-effects arising from this procedure I have always assisted the movement of the tailstock with appropriate hand pressure, especially when the tapered end of a tap is entering or leaving the hole, otherwise there is a good chance that the first threads in the work will be "thinned". To overcome this trouble completely, a sliding tap-holder, Fig. 1(2), was made and provided with collets or bushes to carry the smaller sizes of BA taps, etc. It is useful to know that taps by reputable makers have standard size shanks which, in the range 5 to 12 BA, are .128 in. dia. (+.000, −.003 in.) and for sizes 13 to 16, they are .088 in. dia. although some makers stick to the .128 in. dia. for the whole of the range indicated.

This simple device provides the same facilities for tapping as for die working and its advantages are shown to the full when tapping small BA nut blanks at fairly high speed — say 400 r.p.m. The

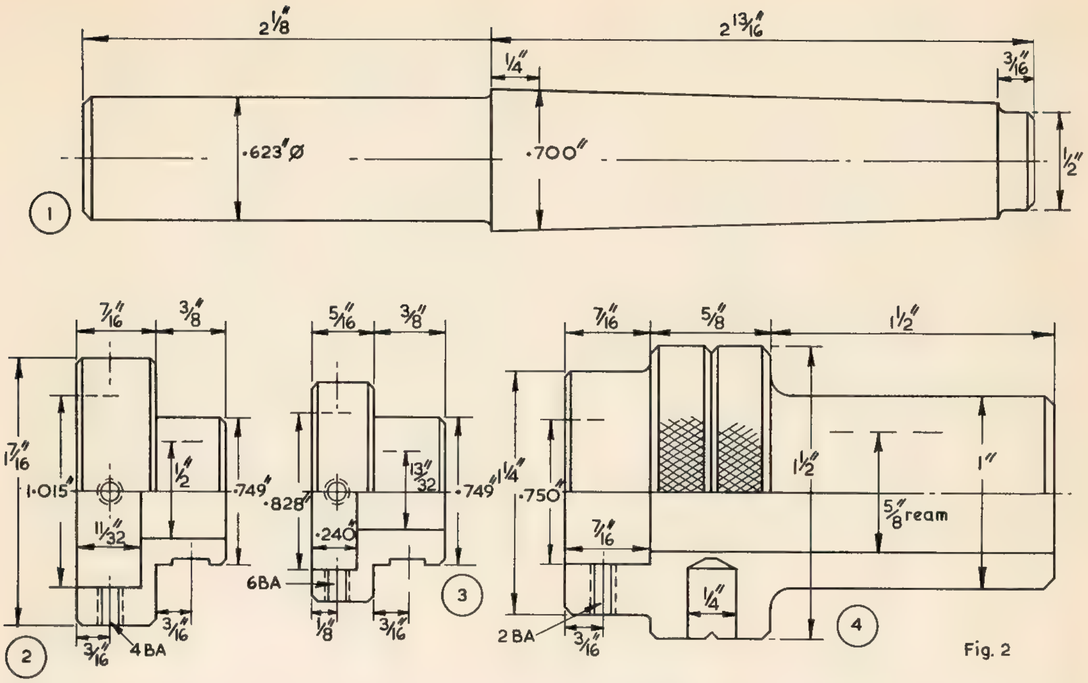


Fig. 2

torque applied to the tap is regulated by the pressure of a finger and thumb which can be relaxed at any moment to allow the tap to spin with the work. Upon de-clutching, the tap can be spun out of the work by flipping with the fingers, thus obviating frequent reversals of the motor.

The tapping depth-stops, Fig. 1 (4), are merely brass collars drilled, tapped and faced in the lathe and provided with 8 or 10 BA screws which can be turned with the fingers so as to engage a flute in the tap. Their manner of use is obvious but then I have many boxes full of such "obvious" devices which no-one else seems to use. Small items such as these make life a lot easier and they exemplify my rule which is to be sure to know what is going on even though one cannot see it. These stops are most useful when making items with blind or stepped holes such as union nuts.

As an example, my fine-scale union nuts for 1/8 in. pipe fitted into GM tails are made from brass hex 7/32 in. A/F which means that there is only .047 in. to provide for: 1. the thickness of metal between the hex. flat and the top of the thread; 2. the depth of the thread; 3. the width of the shoulder to engage the tail; 4. the wall thickness of the tail, to all of which must be added a few working clearances. The thickness of the shoulder which engages the step on the tail is only .020 in. so one cannot afford to have a tap barging into it.

Constructional notes. All the work involved in the making of these die-holder sets is of a fairly elementary nature and should present no difficulties but I will offer a few suggestions regarding procedure for the sake of our less experienced readers.

Bodies

As there are no special problems of concentricity it is suggested that they be turned complete externally with the knurled end towards the chuck. Part-off; turn round in the chuck; face, drill, bore and ream straight through and then turn the recess — where applicable. This, apart from a few holes, completes the bodies except for Fig. 1 (7), which is fitted with a hardened silver-steel stub, drilled through 13/64 in. and provided with two flats for grub screws.

Shanks

These would normally be turned between centres and are hardly worth mentioning but for the Morse tapers, the turning of which cannot be dismissed in a few words. In view of the fact that I have in the course of preparation a full-length article on taper turning which, naturally, deals at some length with the production of Morse tapers, I was tempted to say nothing here but to disinter the unfinished work and get it completed. However, as it would be many months before the article could be published and for the sake of those who might want to get on with the work, I shall give a few very brief notes covering one of the ways of going about it.

1. Rough turn the blanks leaving the M.T. portion parallel at .715 in. dia. and the parallel part also at about 15 thou oversize.
2. Give the top-slide a good going over. Strip it;

remove screw-bracket and screw; clean and oil the slides and adjust the gib strip until smooth movement can be obtained, but without any trace of shake, from one extreme position to the other. As I have mentioned before, this can only be done properly when the slide is unhampered by the screw. If there is any appreciable effort required to turn the handle, then the gib screws are too tight.

3. Set up a standard taper between centres. This can be done using one female centre (fitted into the headstock), the soft centre (in the tailstock) and the hardened centre held between the two.

4. With a d.t.i. in the toolpost run along the taper, tapping the top-slide one way or the other (there will be a lot of this to-and-fro business!) until a constant reading is obtained from end to end. Finally, tighten the slide down properly.

5. Remove the centres and grip the blank by the smaller end in the S.C. chuck. Set a good sharp tool to within about 10 thou of centre height and start turning the taper with the saddle locked in such a position that the full length of the taper will be covered by the top-slide travel. There is sufficient — but not too much! I am suggesting this manner of working without support from the tailstock because there is invariably a tangle-up between it and the top-slide and, in the absence of anything else suitable for the purpose, you are likely to need the tailstock barrel as a gauge.

6. When the taper will enter the barrel (gauge) about halfway there should be very little or no perceptible rock or shake. If there is, mark a line with a soft pencil down the length of the taper and then, while applying a little end pressure to the barrel, twist it to find out whether the taper setting is fast or slow ("fast" is when the angle or taper is too great) and make any necessary adjustments to the setting of the top-slide. That is the tricky bit!

7. When you are getting near the end, remember that a cut of one thou (two thou off the dia.) will allow the taper to enter the gauge by a further .040 in. — in other words, a cut of three thou will

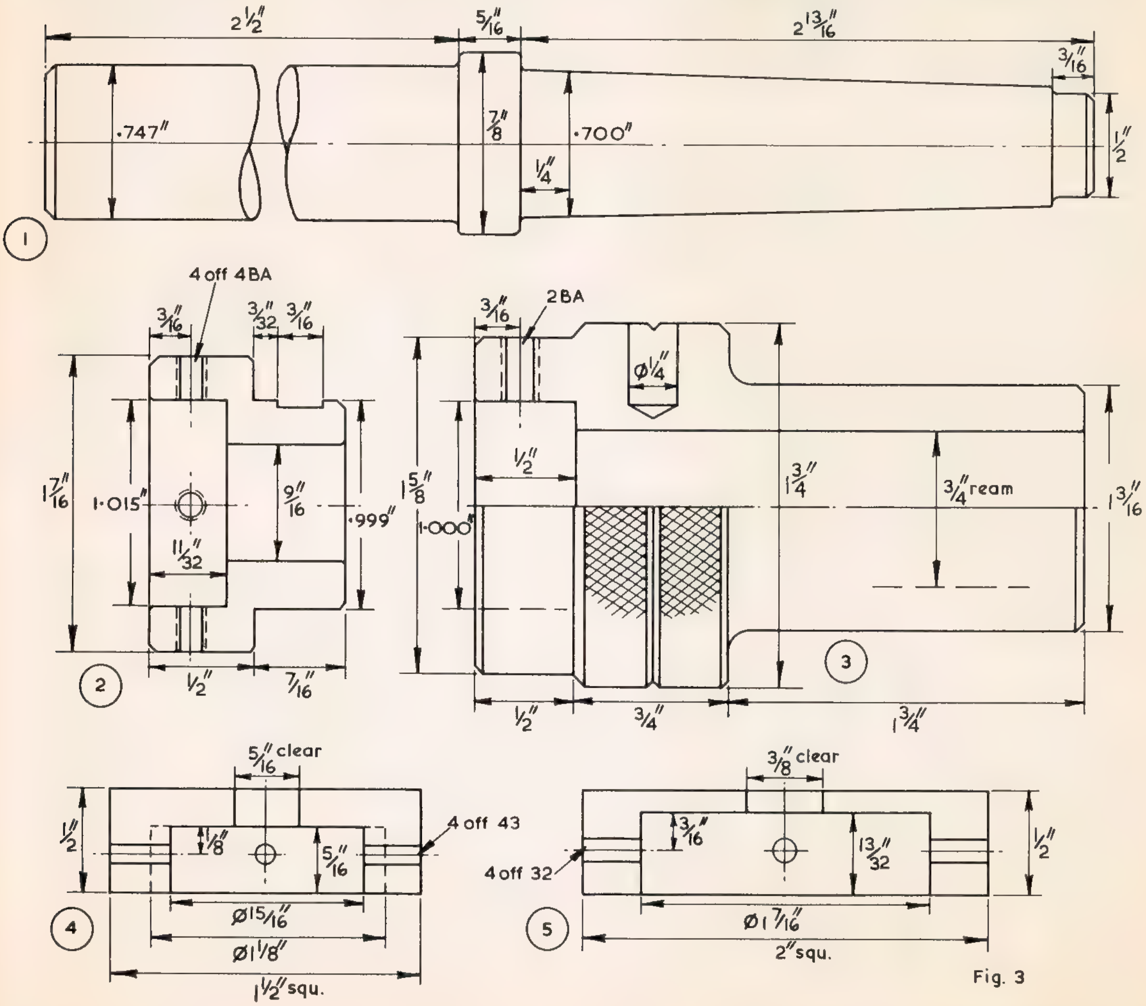


Fig. 3

give an end movement of 1/8 in.

8. Try not to depend on files and emery cloth to produce a good Morse taper because they will not!

9. When you are satisfied that you have a good tapered shank, remove the chuck and knock the taper into the mandrel and turn the parallel portion to dimension. If you are making more than one shank, complete all the taper turning first; probably improving as you go.

Die-holders (5/8 in.)

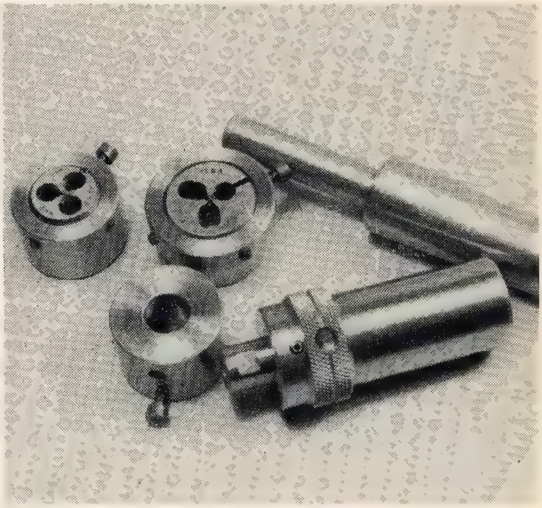
As there could well be many of these, a methodical approach to the job might well save a lot of time and tedium. These, Fig. 1 (6), are the smallest and simplest and should be made, if required, before the 13/16 in. size. They are shown on the drawing as 15/16 in. dia. because mine were turned from 31/32 in. FCMS which I bought on the cheap but they could, just as well, be made 1 in. dia.; the smaller size, however, looks better. A number of slugs were cut off with the hacksaw 1 7/16 in. long and these were gripped in the chuck for facing and turning the o/d, first of one end and then of the other, drilling through 11/32 in. dia. and finally parting-off in the centre, using a 1/16 in. blade.

When the blanks were all prepared to this stage they were returned to the chuck and faced, bored and reamed 3/8 in. and finally, the recess was turned out with the "inside knife-tool" which was described on pages 98 to 100 of vol. 143. Note that the depth of the recess is such as to leave the die standing out about ten thou.

To drill and tap the four holes for the die screws, a jig, Fig. 3 (4), was prepared from a 1½ in. length of 1½ in. × 1/2 in. BMS which was squared up on its four edges and recessed out as shown in the full lines to 15/16 in. dia. — or to fit the holder blanks which were all turned to the same size. The blanks were dropped into the jig, held by a bolt and nut and the four holes then were drilled No. 43. The 4 BA holes, one in each holder, were marked out and drilled individually.

A piece of 3/8 in. steel was gripped horizontally in a small vice which could be clamped to the table of the tapping machine. A number 43 drill was placed in the chuck and a blank fed on to it. The vice was now manoeuvred so that the 3/8 in. bar picked up the hole in the blank exactly and when all was comfortably aligned the vice was finally clamped down, the drill removed and replaced by a tap which was now in perfect alignment with all the holes for tapping (see photo No. 8).

The holders for 13/16 in. dies, Fig. 1 (5), to fit the same body were made in a similar manner except that the 1⅛ in. bar was cut into lengths suitable for one holder each. They were gripped in the chuck for 1/4 in., faced and turned down to 15/16 in. for 3/8 in. length, after which the method was as described previously. The jig, Fig. 3 (4), was opened up to 1⅛ in. as shown by dotted lines and this served later for Fig. 2 (3).



M.T. shank, sliding body and die-holders for BA dies.

Holders for the Larger Outfits

These holders differ in only one respect from the smaller ones in that their method of attachment to the body is inverted. In the outfit, Fig. 2, which has been made for 13/16 in. dies, I have shown holders for 1 in. dies also Fig. 2 (2). The spigots are turned to a close fit in the .750 in. (or 1.000 in.) recesses and are held by these spigots for turning the other ends, including the recessing for dies. Fig. 3 (5) shows the larger drill-jig which is necessary for the 1 in. holders. The only operation on these larger holders which we have not met on the smaller ones is the milling of the flat, which can be carried out in a score of different ways. A very simple set-up would consist of a Myford vice, with the jaws horizontal, on a vertical slide facing the headstock. With the work-piece pushed back into the vice, the position of the flat would be determined by the height setting and the depth of cut by feeding the saddle along towards the headstock. Once the correct settings are obtained all slides should be locked before feeding the work across a 3/16 in. or 7/32 in. end-mill, using the cross-slide.

In case any readers might feel, and I am sure that some will, that a de-luxe die outfit such as I have described would occupy too much time in the making, I have a record of some of the times actually taken, from which I see that the 13/16 in. holders took 14 minutes each which includes all turning to fairly close limits and good finish, drilling and tapping four holes and milling the flats. The 1 in. size took 18 minutes each so the whole lot, of 30 holders, could be made in an eight-hour day.

JEYNES' CORNER

A Nicer Rally

THE TITLE of these notes is formulated from the initials of the Northumbrian Internal Combustion Engine Restorers, who in conjunction with the Tyne and Wear County Council's Museums, and the Tyneside Society of Model and Experimental Engineers, put on the event noted in the Editor's "Club Chat" in *Model Engineer* for 1 September.

The T.S.M.E.E. were having an open week-end, and on Saturday the weather was not too bad, but a heavy downpour on the Saturday night ensured that all the exhibits which were not covered up in the Exhibition Park had a light deposit of rust on the bright steel and iron, while the polished brass also suffered. The drizzle which continued for most of the Sunday did not prevent large numbers of visitors from attending the events, which were centred around two marquees.

The Science Museum was opened at 8 a.m. on the Sunday to give additional toilet and washing facilities to exhibitors who camped in the Park, many having come considerable distances. The Museum opened to the public at 10 a.m. on the Saturday, and 11 a.m. on the Sunday, and some thousands of visitors passed through during the week-end.

The large marquee contained stands for various Societies and for exhibition of selected models from the Museum, which were coupled up to a compressed air supply, another stand outside displayed models working on live steam. A model overshot water wheel was merrily turning over, causing quite an amount of froth in the working medium; a fan driven by a hot air engine kept the air moving in the tent.

On another stall Ernie Cheeseman was exhibiting his partly completed model colliery, backed by a large framed collection of photographs taken at different stages of the construction. As Newcastle was once the centre of a large mining area, much interest was shown in this model, by many who admitted they had no interest in model engineering.

There were no steam traction engines present in full size, but a large Ruston Proctor portable engine built in 1898 was present, turning over at a pace that showed the owner knew all about valve setting; this remark also applies to the several steam engines being supplied by the portable engine's boiler forming a small exhibition on their own. There were several steam engines and pumps operating on compressed air, and several Scotch crank types were to be seen.

There was a good show of Amanco, Lister, Petter, Wolseley, and Bamford engines, also one or two Villiers and some not so well-known engines. The largest internal combustion engine present was a 30 h.p. Tangye crude oil engine mounted on a steel-wheeled trailer which had an auxiliary compressor mounted to supply starting air.

To my mind, the best engine running was an 8 h.p. horizontal Blackstone built circa 1919, bought secondhand in 1935, to drive a sawmill, which duty it performed for 42 years. It has been excellently restored to the condition this firm turned out their products in the days I fitted them up; even engines destined for farm work had their distinctive finish. This engine was fitted with low tension magneto ignition and was running without a sound of piston flop or bearing slack knock, and could possibly do another 42 years I would say.

The best small internal combustion engine was a ½ h.p. Hartop horizontal. I'll bet old Frank Hartop would have been proud to see it. It was driving an ancient Crocker-Wheeler Kapp type dynamo (a museum piece in its own right), and the whole running like a sewing machine with just about the same sound, in contrast to the pops and bangs around it, arising from the exhaust valve governed engines. This little engine had no fancy brasswork, it was all in use.

There were several engines from Mr. J. Moffitt's large collection, one being a Robinson hot air engine made by Gardners, probably in the 1880s. Further on there was a mobile laundry with an intricate worm-driven belt shifter for the purpose of reversing rotation of washer drum.

Among the steam engines was a small compound which was evidently intended as a marine engine, but was fitted with link-motion reversing gear only on the low-pressure side, apparently not having been finished. However, it did reverse rotation on moving the reversing lever over, but didn't run so well in one direction.

Altogether an enjoyable week-end despite the dampness, the air filled with the sounds of long ago accompanied by tunes of bygone days from a Fairground organ standing by the marquee. The organisers deserve full credit for the running of everything from the "Barbecue" to the provision of mobile toilets. Organisers of other events might notice the latter conveniences, so often overlooked at outdoor functions.

The judging of both T.S.M.E.E. and N.I.C.E.R. exhibits took place separately, the former requiring a Solomon's intellect. However Ernie Cheeseman managed to carry it out, his wide engineering experience standing him in good stead. The judging of the N.I.C.E.R. exhibits was not so hard, as the size allowed the sounds of wear or maladjustment to be evident to experienced ears, and wobbly shafts are more easily seen; several thou on a 3 in. flywheel gets up to larger fractions of an inch on a 24 in. wheel.

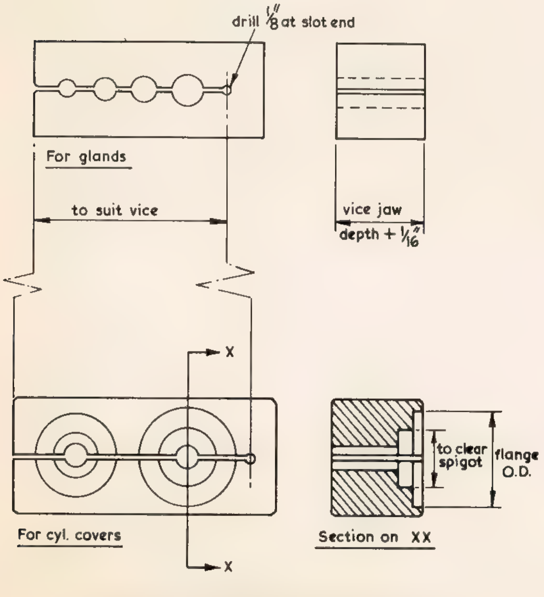
UNCONSIDERED TRIFLES

by 'Tubal Cain'

IT IS A FUNNY THING, but when I get visitors to my workshop it is always the little odds and ends of gadgets that seem to excite the most curiosity. People may say "oooh" at the Lorch, or admire the Holtzapffel made in 1805, but it is usually something I have knocked up in a few minutes that brings out the notebook.

For example, a short while ago I had to mark out a couple of holes centred from an existing one. The proper tool for this job is a pair of dividers one leg of which ends in a ball. Standard equipment for a journeyman marker-off, but I haven't got one. So, I just chucked a bit of scrap that nearly fitted the hole and turned it till it did, dabbed the faced end with my smallest slocumbe and parted-off. A tap with a centre-punch deepened the centre in the end, the piece was dropped into the hole and I had a centre for my divider-leg. Simple and quick, but the chap who was with me — not without a fair bit of experience—hadn't seen it before. He hadn't thought of having a "Blackboard" either, which surprised me, as he uses them all the time in his work!

So, it occurred to me that a few notes on such things might not come amiss even to those of you who bought your first lathe just after the Boer war!



DRILLING FIXTURES: hardwood (see text)

Fig. 1

"All the books" tell you that work should be clamped or held in a vice when drilling, especially when drilling brass with a twist drill; else the work tends to climb up the drill on breaking through, taking with it a nice chunk of red meat from your thumb. But how on earth can one hold (e.g.) a gland with an oval flange and a cylindrical body without distorting it? (For it is worse than useless if you don't get a proper hold of it.) Fig. 1 shows the fixture I use — and I have them in various sizes.

A piece of hardwood — close grained, not oak; I use Lignum Vitae (which can be had from scrap bowls woods or foundry rammers) or Boxwood — made up square on the faces. Drill a series of holes corresponding to the usual sizes of gland stem you are likely to make, using a sharp twist drill and running as fast as you can. Make a sawcut through the centres of all the holes almost to the end of the block. You can then grip this in your machine vice, when it will close up and hold the work quite securely.

A variation is also shown which I use to hold such things as cylinder covers, made either to grip by the spigot or on the outside diameter; the second is best. In this case the cavity to accept the work is bored in the lathe and the bottom of the cavity faced flat (as is the opposite side), but you do need a hole right through to poke the work out after drilling.

After a while, of course, the fixture gets riddled with drill-holes, but it's easy enough to make a new one — easier than growing a new finger or two. In the case of the gland-hole fixture you can turn the thing over and use the back. Why not make it of brass or some such? For no other reason than that wood is good enough and far cheaper! Incidentally, you can use a variation on the same theme for holding work in the lathe.

I don't like gripping (again, for example) cylinder top covers by the spigot to turn the other face. It's not a secure grip and in any case why make the spigot a good fit if you intend to maul it about with the chuck jaws? "The books" tell you to machine up a steel or brass fixture to take the work, slit it and use this in the chuck. Why not wood? I can assure you that both Lignum and Boxwood will serve, even with iron unless the skin is very hard. But it must be hardwood and close grained.

Now for the lathe. I have mentioned before the wood plug I use in the tailstock taper-hole to protect it and keep dirt out, and which can also double as a cleaner if a piece of flannel is wrapped round. You need one for the headstock as well, for swarf

can get down the mandrel bore and if not cleaned out before fitting a centre will spoil the truth of the bore. However, one essential feature of most lathes is the hollow mandrel through which bar-stock can be poked, and it's a bind if this is blocked up. Try Fig. 2.

A plug is machined (boxwood again) to fit the Morse taper and then inserted in the mandrel, when it is drilled to fit the largest bit of tube that will pass through the mandrel. The wood is then cemented to the tube with Araldite — but make the tube long enough to project just a little from the tail end of the mandrel. A small collar, also of wood, is cemented near the far end of the tube, otherwise it rattles about unless the tube itself is a good fit to the hole.

Now, any swarf will pass through the tube and emerge at the far end; stock of reasonable size can still be held in 2 ft. lengths or whatever, and on the odd occasions when you need the full bore of the mandrel you just knock out the tube assembly. Unlike the tailstock plug (which, you will remember, is split down most of the taper length) it can't be used for cleaning out, but then, I use the tailstock plug for this purpose, and so can you. An added and incidental advantage of the gadget is that if you are using a lot of coolant any that gets through the chuck is discharged clear of the change-wheel assembly at the end of the machine.

Talking of which, look at Fig. 3. When I built my new workshop (new? It's six or seven years ago now!) I painted the walls and hung a metric equivalent chart behind the Myford. Within days, if not hours, there was a nasty streak of oil over both, thrown out from the chuck. The guard seen in the sketch was made to correct this. It is fitted to a bolt-hole that appears on the headstock of the Super-7, but one could easily be drilled if there isn't one on your machine.

It is arranged with a double-spring washer under the bolt head, so that it stays put but can be moved, if you follow. It does foul the back of the cross-slide when working close to a faceplate (though it clears for chuck work), when you have to cock it up a bit. It has the added advantage that it protects the motor from much of the fine chipping thrown out when machining brass at high speed. This gadget was so effective that I made a similar affair to protect the workshop window from oil thrown out of the countershaft bearings on the Lorch.

I made the second guard, Fig. 4, at the same time. This clips onto the deep drip-tray which sits under the lathe, and helps to keep the back of the bench clean, as well as keeping *some* of the swarf off the rack of accessories I have behind the machine. This rack is not as good an idea as I thought at the time I made it — it's a sort of shelf on which sit drill-chucks, centres, often-used cutting tools, spanners, etc., all lodged in fitted holes or trays. Very convenient and saves a lot of time, but

The guard against lapses of memory!

despite all the guards it does collect a lot of dirt; I didn't have so much trouble on the ML7, but the higher speed on the Super-7 does result in swarf flying quite a distance.

Which leads to the next gadget. I don't know why manufacturers of lathes make their leadscrews with the thread extending (at both ends) far beyond any point to which the leadscrew nut can reach, but they do! (It may be for ease of manufacture, I don't know.) The last inch or so at the headstock end is redundant, and collects dirt like nobody's business — it doesn't *matter*, of course, as the nut never reaches it, but it looks revolting and cleaning takes time. So, whilst in a guarding mood I made up Fig. 5. It is so arranged that when the saddle is at extreme travel the screw-guard attached thereto passes over it, and as you can see is spaced a little away from the lathe bed, so that oil or cutting fluid can pass through. As I say, it serves no functional purpose, but does look better!

Guarding against dirt is one thing; but "human error" is a more serious matter. Like engaging the leadscrew for a feed of 6 thou per rev, to find that you cut an 18 t.p.i. thread instead. This can be quite an experience at 1800 r.p.m., with the saddle belting along at about 1½ inches per second! Fig. 6 helps to avoid this. The little label has "fine feed" painted on one side, and "screwcut" on the other. Beneath it is another identical label marked "special thread", which is used when the banjo is set up for cutting threads not indicated on the gearbox, which means that neither the fine feeds *nor* the pitch indications are correct. You will also notice a couple of little arrows painted against the tumbler reverse lever. In my case this is rather more important than usual, as on the Lorch (when set up with the normal arrangement of changewheels) the reverse lever works to the opposite hand to that on the Myford. The labels are made of brass, and hang on a 5 BA screw in a tapped hole in the gearcase, with a nut inside.

Still on the subject of "human error", but not shown in any figures, is a simple safety precaution; all my lathe carriers, and the peg of the catchplate, are painted a vivid yellow-orange colour. Even at moderate speeds these items can become almost invisible when rotating if left grey, and it is all too easy to catch the knuckles on them. Over the years one does learn to be careful and to treat rotating machinery with the respect it deserves — the best safety precaution of all. Nevertheless it is well worth while taking such a simple step over a known hazard like the catchplate-carrier set-up.

I have left the most commonly remarked upon item till the end. This is my table of cutting speeds, etc. hung up behind the lathe, and which is drawn up in such a way as to remove the need for calculation. However, I must say a word or two about these speeds before referring to the table.

Text-books on "Production Engineering" and reference books like "Machinery Handbook" all contain tables of cutting speeds for most metals and for different tool alloys. It must be remembered however, that these are devised for optimum production, not for best tool life. A low cutting speed can give a long time between tool grinding, but also a long floor-to-floor time on the workpiece. High speed reduces tool life, but speeds up the time to make each component.

Depending on the time taken to regrind and the cost of the tool, there is a "best" cutting speed for each tool/work material combination which gives the lowest cost per workpiece, whilst maintaining proper surface finish for the job. This speed — and the associated feeds and depth of cut often quoted in such tables — is seldom appropriate to the model engineer, even if his machine would stand up to it.

I have a piece of "swarf" on my desk where the cut was 5/8 in., the chip section being about 5/8 in. x 1/2 in. x 3/4 in., about 4½ in. long and weighing just over 4 ounces. It is bright blue from the heat of cutting, and at the speed I was then using I could have removed nearly a ton and a quarter of steel an hour! The machine was *not* an ML7, and the tool life was about 50 minutes!

So, the speeds shown in my table are those I have found to give a reasonable tool life in the past. Some may think they are a bit low, but should remember there is only a small motor at the back of the machine. Others may find some a trifle high, especially if they are using shaped and forged H.S.S. tools; for most purposes I use ground tool-bits 5/16 in. square which nicely fit my four-tool turret. These show a longer life than the conventional H.S.S. tools. I have a few tools in "Stellite" which can be run a bit faster. For carbide tools I run at roughly double the speeds in the table, and for carbon steel about half. With a parting tool in the rear toolpost I run at about 80 per cent of the tabled speeds.

The chart is pasted to a sheet of card and varnished; I did have it in a cellophane envelope, but this didn't last long. The first line gives the nominal mandrel speeds for the Super-7, those marked * using the back-gear. The second line gives the diameter in inches corresponding to 100 ft./minute for each speed, and this enables you to work it out in your head if you want to use any other constants than I have tabled. The other lines show the diameters of work for different materials, and you will see that there are two sizes at each speed; the larger is for finishing cuts, the smaller for roughing. Other figures below the table show the "useful constants" for the lathe.

Let me repeat — these make no claim to be the "best" speeds — they are just those I have found to give reasonable service. So, don't just copy them

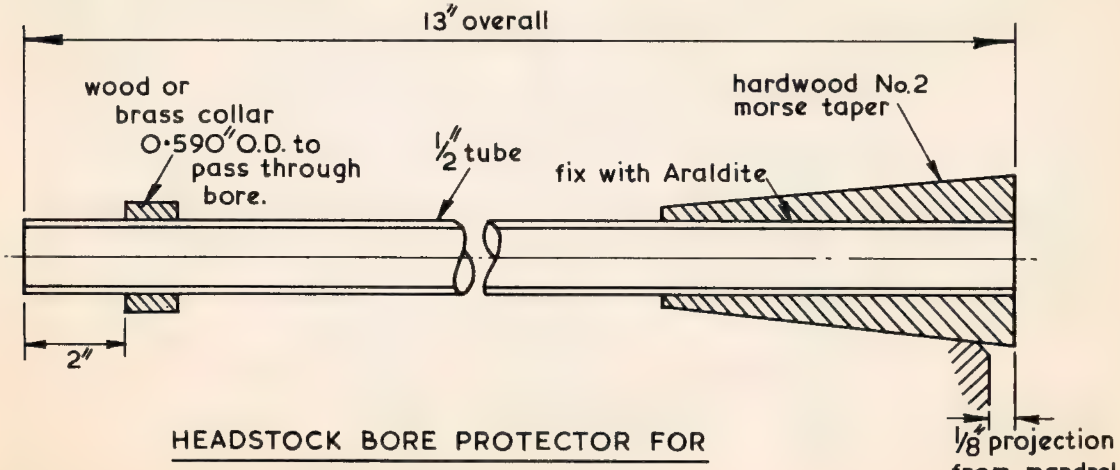
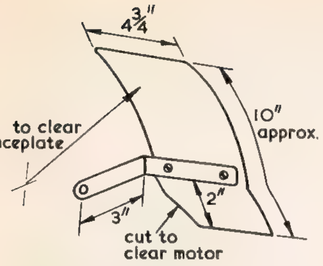
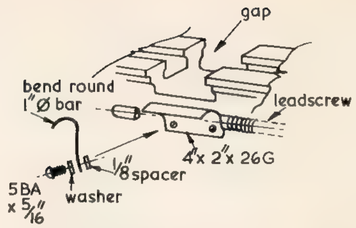


Fig. 2 HEADSTOCK BORE PROTECTOR FOR MYFORD SUPER 7



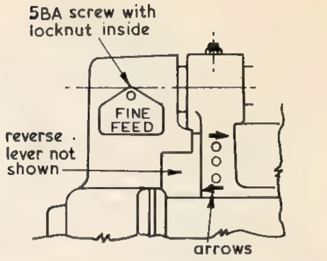
CHUCK SPLASHGUARD

Fig. 3



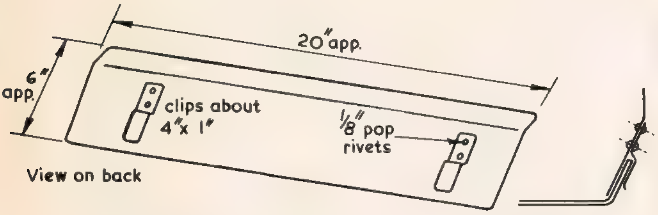
LEADSCREW SWARF GUARD

Fig. 5



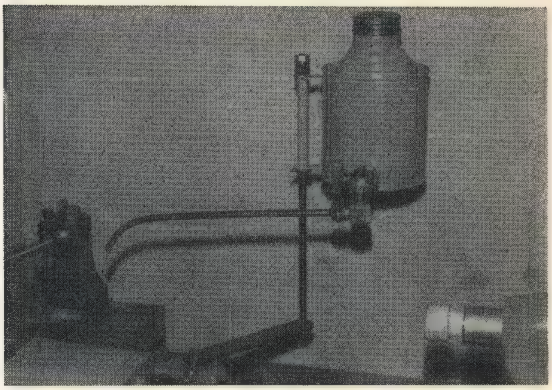
FINE FEED & REVERSE INDICATORS

Fig. 6



EXTENSION TO DRIP TRAY

Fig. 4



The slosh can.

out — check from your own experience and make up a table to suit yourself. But it may be a helpful starting point for the newcomer; of all the gadgets in the shop this, and the rear splashguard, seem to be those most frequently "made a note of"!

As well as the sketches I have included a few photos. One is not described above — my "slosh can". I claim no originality for the idea, as it is one I made up 30-odd years ago after a sketch by the late Edgar Westbury. However, there are two points about it worth noting. First, there is a spring (not a spring washer) between nut and the support lug on the can, which allows free movement to suit the job, but stays put when moved. Second, there is no air-hole in the lid; fine adjustment of flow can be effected by screwing down the lid more or less, and so controlling the pressure difference between the can's insides and the atmosphere. I say "pressure" but of course this will be a partial vacuum within the can as the stuff runs out. The tap and swivel are from an old gas bracket picked up in a scrapyard. The whole is carried from the tapped hole provided by Myfords to carry their coolant feed, and there is a spring washer under the bolt head here, too, to enable the assembly to be swivelled.

So, there we are. A few trifles, none takes long to make, none an earth-shattering invention, but all make life in the workshop just that little easier.

CUTTING SPEED CHART — MYFORD SUPER-7 LATHE
HIGH SPEED STEEL H3

Material/RPM	2150	1480	1020	700	615	425	290	200	130*	90*	80*	55*	40*	25*
100 ft/min =	.178	.260	.374	.545	.620	.90	1.32	1.9	2.9	4.2	4.8	6.9	9.5	15.3
C.I., Bronze,	–	.125	.187	.25	.28	.4	.6	.75	1.26	1.9	2.2	3.0	4.5	7.0
Cast GM, Alloy steel	–	.125	.190	.26	.32	.44	.63	.88	1.5	2.12	2.5	3.5	5.0	8.0
Freecutting	.23	.34	.49	.71	.81	1.2	1.7	2.5	3.8	5.5	6.2	9.0	–	–
Mild Steel	.28	.41	.60	.87	1.0	1.48	2.1	3.1	4.7	6.8	7.7	10.0	–	–
Brass and	.18	.26	.38	.55	.63	.90	1.3	1.9	3.0	4.25	4.8	7.0	9.5	–
B.D.M.S.	.21	.31	.45	.65	.75	1.1	1.7	2.3	3.5	5.1	5.7	8.0	10.0	–
Duralumin	1.1	1.6	2.3	3.2	3.8	5.4	8.0	11.5	–	–	–	–	–	–
	1.4	2.0	3.0	4.3	5.0	7.2	10.5	–	–	–	–	–	–	–

Table gives stock diameter in inches, assuming appropriate cutting fluid.

Saddle to centre height	= 2.068″	Hole through mandrel	= 0.593″
Bed to turret base	= 3.205″	Topslide travel	= 2.375″
Bed to topslide face	= 2.871″	Cross-slide travel	= 6.25″
		Drill chuck travel	= 2.9″ max.

*In back gear.

FURTHER NOTES ON PICK-UP WITH THE DOG-CLUTCH CONTROL FOR LATHE SCREWCUTTING

by Martin Cleeve

FIRST LET US RECALL that when a threading tool is repositioned by hand turning the leadscrew by wheel *J* with the half-nuts *N* (Fig. 1, *M.E.* 18 March 1977, reproduced below) remaining in engagement throughout the entire screwcutting operation, repeat pick-up (avoidance of crossed threads) is assured for all pitches, English, metric, worms to mesh with gears sized by diametral pitch and module, and British Association (BA), and it is indeed impossible to devise any gearing between the lathe spindle and leadscrew for which pick-up would fail — regardless, too, of whether the leadscrew is to English or metric standards.

Under these circumstances, distance *X-Y* depends entirely and only upon the length of the thread being cut, and the starting clearance *Z* (which is included in the distance *X-Y*) can be held to any convenient minimum — although for very short threads it is as well to somewhat extend the starting clearance when high-speed threading so as to avoid a confliction between clutch engagement and automatic disengagement.

As mentioned in the previous article, if it is possible to reset the carriage and threading tool by rack and pinion this would obviously be quicker than hand turning the leadscrew, but some readers have expressed puzzlement over how distance *X-Y* is then calculated, although I wonder if those readers are subconsciously doing what I sometimes do: seeking a complexity that really is not there!

Remember that when rack and pinion traversing from *X* to *Y* to reposition a threading tool for the next cutting pass, the leadscrew will not be rotating (even though the workpiece may remain in motion), so this limits possible right traverse saddle movement to steps of 1/8 in. (for a leadscrew of 8 t.p.i.).

So the resetting distance *X-Y* is decided by how many 1/8 in. steps on the leadscrew will embrace, cover, or include a *whole* number of thread turns on the workpiece plus starting clearance: resetting assumes that the whole of the distance *X-Y* is threaded with the thread being cut, even though some of the thread turns will be missing to give a starting clearance.

Reproduced from p. 334, 18 March 1977 issue.

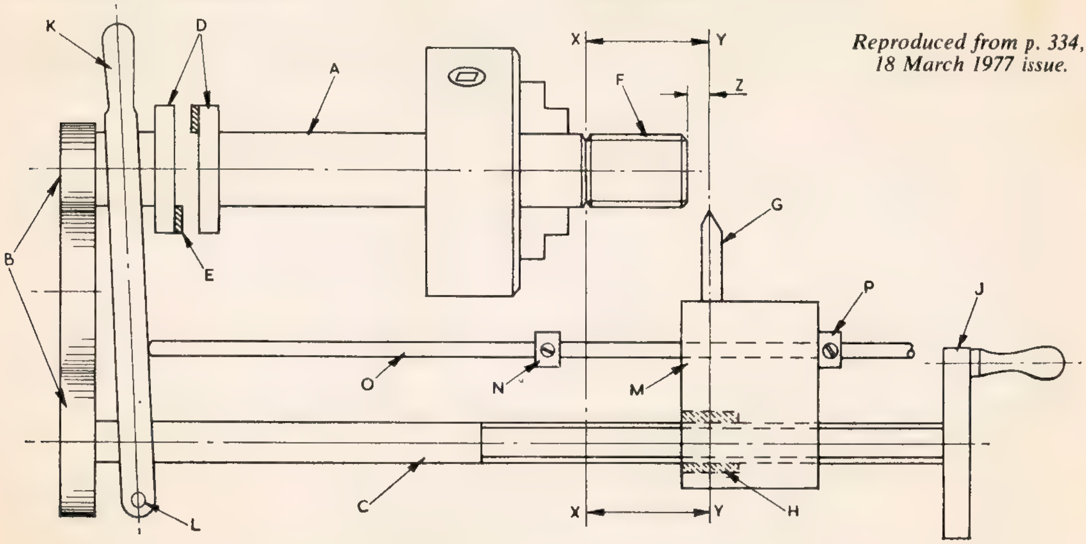


Diagram illustrating how a lathe can be designed (or modified) to give instant repeat pick-up for all thread pitches

If you are cutting 7, 9, 11, 13, 15, 17, 19, etc. t.p.i. then *X-Y* cannot be less than one inch (8, 1/8 in. steps on the leadscrew) however short the thread on the workpiece, simply because a lesser number of leadscrew threads would embrace a fractional number of the threads being cut, and pick-up would be lost.

If, for example, you are cutting a thread of 19 t.p.i. of less than one inch length, the fact still holds that *X-Y* (which includes a starting clearance), if of one inch, would "hold" 19 thread turns. But, if *X-Y* is made to equal only 7/8 in. (7 leadscrew threads), this distance would embrace $19/8 \times 7 = 16\frac{5}{8}$ work thread turns, and pick-up would be lost. (Although if you persist with this setting you would automatically index an 8-start thread!)

So for threads per inch that are odd numbers, primes, or not divisible by 2, distance *X-Y* must be determined in units of one inch (8 leadscrew threads) according to the length to be cut.

For t.p.i. divisible by 2, such as 14, 18, 22, 26, distance *X-Y* is determined in units of 1/2 in. (4 leadscrew threads) according to the length of the thread to be cut.

For t.p.i. divisible by 4, such as 4, 12, 20, 28, etc., distance *X-Y* must be in units of 1/4 in. (2 leadscrew threads).

And for t.p.i. divisible by 8, such as 8, 16, 32, 40, and so on, distance *X-Y* can be in units of 1/8 in. (1 leadscrew thread) which means that the half-nuts can be re-engaged at any 1/8 in. position along the lathe bed that will give a reasonable starting clearance *Z*.

Note, however, that when repositioning by rack and pinion traverse, the leadscrew must not be rotated until the half-nuts have been re-engaged: after this you can once again turn the leadscrew handwheel *J* if you wish to for any reason, and pick-up will not be lost.

A Few Examples

A 2½ in. length of 19 t.p.i. would require a right traverse *X-Y* of 3 in.

A 1¾ in. length of 24 t.p.i. would require a right traverse *X-Y* of 1⅞ in.

A 3/4 in. length of 14 t.p.i. would require a right traverse of 1 in. (Although a right traverse of only 7/8 in. would offer a 1/8 in. starting clearance, pick-up would be lost because 7 leadscrew threads embrace the fractional number of 12¼ thread turns on the workpiece plus starting clearance.

But in practice, figures like these never have to be worked out. You simply say to yourself: "14 t.p.i. with an 8 t.p.i. leadscrew is a minimum of 7 t.p.i. in 4 leadscrew threads = 1/2 in." And you know at once that *X-Y* must equal 1/2 in., 1 in., 1½ in., 2 in., 2½ in., 3 in., and so on, according to what length *X-Y* will cover the thread to be cut and give a reasonable starting clearance *Z*!

To Find Distance X-Y for a Metric Leadscrew

This is slightly more involved, but a few examples should make all clear.

If the leadscrew is to metric standards, the resetting distance *X-Y* is found from:

$$\frac{\text{Metric pitch to be cut}}{\text{Metric pitch of leadscrew}}$$

with numerator and denominator brought to whole numbers by a suitable multiplier where necessary. The numerator so treated will then show the minimum whole number of leadscrew threads, and the denominator the minimum whole number of component thread turns.

Example 1. 1.5 mm pitch to be cut from a leadscrew of 3.0 mm pitch:

$$\frac{1.5}{3.0} = \frac{15}{30} = \frac{1}{2} = \frac{1 \text{ leadscrew thread}}{2 \text{ work threads}}$$

showing a minimum of 3.0 mm for *X-Y*.

Example 2. 2.5 mm pitch to be cut from a leadscrew of 3.5 mm pitch:

$$\frac{2.5}{3.5} = \frac{25}{35} = \frac{5 \text{ leadscrew threads}}{7 \text{ work thread turns}}$$

and 5 leadscrew threads × leadscrew pitch = 5 × 3.5 = 17.5 mm minimum for *X-Y*.

So, the half-nuts can be reclosed at 17.5 mm, 35 mm, 52.5 mm and so on, to the right, according to component thread length.

Example 3. 4.0 mm pitch to be cut from a leadscrew of 3.0 mm pitch:

$$\frac{4}{3} = \frac{4 \text{ leadscrew threads}}{3 \text{ work turn threads}}$$

and 4 leadscrew threads × leadscrew pitch = 4 × 3 = 12 mm minimum for *X-Y*.

So the half-nuts can be re-engaged at 12, 24, 36, 48, 60 mm to the right according to component thread length.

Example 4. 2.75 mm pitch to be cut from a leadscrew of 3.0 mm pitch:

$\frac{2.75}{3}$ multiply numerator and denominator by 4 to bring to whole numbers and we have:

$$\frac{11 \text{ leadscrew threads}}{12 \text{ work turn threads}}$$

and 11 leadscrew threads × leadscrew pitch = 11 × 3 = 33 mm minimum for *X-Y*.

So the half-nuts can be re-engaged at 33, 66, 99 mm and so on, if the thread to be cut is longer than about 26 mm.

In a great majority of instances, to take advantage of the quicker rack and pinion resetting of a threading tool, the thread being cut should be in the same language as that of the leadscrew. If you are cutting t.p.i. the leadscrew should be in terms of t.p.i., and if you are cutting metric threads, the

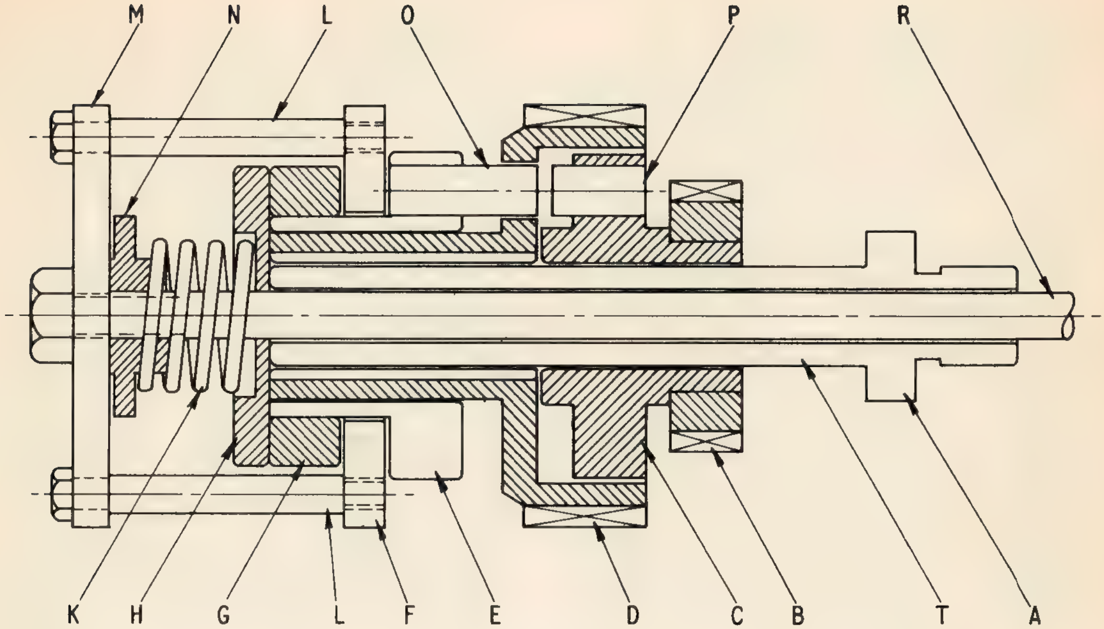


Fig. I CLUTCH ASSEMBLY FOR SCREWCUTTING LATHE. THE COMPLETE DEVICE GIVES AUTOMATIC STOP ON COMPLETION OF EACH SCREWCUTTING PASS.

A. MAIN SPIGOT
B. 25T PINION
C. DOG BOSS
D. 40T DRIVER
E. SLIDING DOG BOSS
F. FREE COLLAR
G. RETAINING COLLAR
H. RETAINING WASHER
K. PULL OFF SPRING
L. COUPLING RODS
M. LINKING BAR
N. ADJUSTING NUT & SPRING CENTRALISER
O. SLIDING DOG
P. NON-SLIDING DOG
R. OPERATING ROD LINKED TO HANDLEVER CONTROL & TRIP MECHANISM

leadscrew should be of metric pitch. Moreover, the gearing between the lathe spindle and leadscrew should be theoretically exact: that is to say it should not be an approximation if you wish to avoid further calculations.

For example, when cutting a thread of 19 t.p.i. from a leadscrew of 8 t.p.i., the gearing should be in the ratio 8/19, and calls for a 38T wheel, the complete ratio as set on the quadrant being:

Driver 20 — A — 50
40 — 38 leadscrew

the 50 and 40 being coupled on the same quadrant stud. But if you happen not to have a 38 wheel, you may decide to use approximation gearing such as:

Driver 21 — A — A — 50 leadscrew

which would cut a thread of 19 1/21 t.p.i. With this ratio however, pick-up would no longer be 19 work thread turns to 8 leadscrew threads = 1 in. for *X-Y*, but would be 21 leadscrew threads to 50 work thread turns, giving a minimum of 21 × 1/8 in. = 2⅝ in. minimum resetting distance *X-Y* because 21/50 cannot be further reduced in whole numbers.

This is not to say that if approximation ratios are used, pick-up, or *X-Y* resetting distances cannot always be found: there will be an *X-Y* distance for every gear ratio between lathe spindle and leadscrew, although for some ratios it would not be possible to make use of the distance because the *Y* position may fall beyond the right hand end of the lathe bed!

This happens, for example, if you are cutting a thread of 19 t.p.i. from a leadscrew of 3.5 mm pitch, using the approximate translation ratio of 14 × 39/5 × 43 where the quadrant gearing becomes:

Driver 40 — 43 20 — 50 leadscrew
39 — 38

but this gives an *X-Y* distance of 1092 mm minimum, so there would be no alternative but to reset the saddle for each fresh threading pass by leaving the half-nuts engaged throughout and repositioning the saddle by hand turning the leadscrew — if the number of threads to be cut would not warrant changing the leadscrew to one of t.p.i. standards.

How is Pick-up, or X-Y Calculated When Approximation Gearing is Used?

It so happens that if you know what gearing is set on the quadrant, pick-up is easily found by reducing the driving and driven gears to their lowest whole, or integral number terms. The "driving" figure will then show minimum whole leadscrew threads or turns, and the "driven" figure will show the minimum whole component thread turns that would span the same length as the leadscrew threads.

For example, the gearing just given for cutting a thread of 19 t.p.i. from a leadscrew of 3.5 mm pitch reduces to

$$\frac{8}{19} \times \frac{39}{43} = \frac{312 \text{ leadscrew threads}}{817 \text{ work thread turns}}$$

and 312 leadscrew threads of 3.5 mm pitch equals 1092 mm — about 43 in. or 3 ft. 7 in. minimum, so rack and pinion resetting of the carriage on my lathe would not be possible in this instance.

Of course, difficulties could arise if the lathe has a selective gearbox for screwcutting and you do not know what translation ratio is used, for example, for cutting metric threads with an English leadscrew. The Myford selective gearbox uses the ratio 13:33 (instead of 50:127) for "translations" from English to metric standards and to find minimum pick-up distances *X-Y* you would first have to use the formula:

$$\frac{\text{Driving gears}}{\text{Driven gears}} = \frac{4P}{5} \times \frac{13}{33}$$

wherein P = the metric pitch to be cut.

So for a metric pitch of 1.0 mm we would have

$$\frac{4}{5} \times \frac{13}{33} = \frac{52 \text{ leadscrew threads}}{165 \text{ work thread turns}}$$

and 52 leadscrew threads of 1/8 in. pitch = 6½ in. for *X-Y*.

Example 2. Find *X-Y* for a pitch of 2.75 mm with the Myford gearbox:

$$\frac{4 \times 2.75}{5} \times \frac{13}{33} = \frac{13 \text{ leadscrew threads}}{15 \text{ work thread turns}}$$

and 13, 8 t.p.i. leadscrew threads = 1⅝ in. minimum for *X-Y*.

Although when translating from English to metric or vice versa, pick-up or *X-Y* figures can be objectionably long, knowledge of what is going on can be useful on occasion. For example, when I made a new cross-feed screw of 2.0 mm pitch (to suit a simple dual metric/English reading dial) I wanted the screw to have a thread length of 7¾ in. The leadscrew was of 8 t.p.i. and I used the (basic) gear ratio of 63/100, showing 63 leadscrew threads to 100, 2.0 mm work thread turns (error plus 1 in 8000, assuming a perfect leadscrew). And 63 leadscrew threads of 1/8 in. = 7⅞ in. for *X-Y*, thus giving a 1/8 in. starting clearance for the 7¾ in. length of thread to be cut. So I was able to quickly return the carriage and tool to a right-hand stop after each threading pass instead of tediously hand turning the leadscrew backwards through 63 revolutions.

Instant Runout Stop

If reasonable attention is given to minimising play between moving parts, pivot slackness, and so on, then the system illustrated in (Fig. 1 *ME* p.334, 18 March 1977) "levered and cranked" to suit individual cases should give good results, with arrest of screwcutting traverse motion within a few thousandths of an inch when the dogs disengage. The only disadvantage with this "direct" method of dog-clutch disengagement lies in the fact that dog-tooth separation takes place at about the same axial speed as that of the saddle movement, so that just before final disengagement, the dog teeth are driving on their tips. However, this method works well enough on that "Rolls-Royce" of lathes, the Hardinge HLV-H high precision lathe, but here, for the dog "teeth", Hardinge use hardened steel sectors with razor-sharp corners. Final dog-tooth separation is assured by a slight overrun from stored energy in the leadscrew driving gears.

When making my own single tooth dog-clutch conversion I was feeling my way somewhat in the dark — I knew more or less what I wanted, but for a long time could not see how to fit a clutch without virtually redesigning the whole headstock or fitting a cumbersome box of tricks at the left, which might have made difficult the alteration of change gearing on the quadrant. In fact I used to pop into the workshop and stare at the lathe from time to time for inspiration.

I could think of nothing more desirable than to watch the saddle stop itself at the end of each threading pass, thus avoiding the anxiety usually associated with screwcutting: with the added very significant bonus of repeat pick-up for all thread pitches.

Then one day I hit upon the ideal:

1. Fit the single-tooth dog-clutch to an extended tumbler-reverse spigot.
2. Engage the clutch against a strong spring by means of a pull-rod running through the centre of the new tumbler-reverse spigot.
3. Lock the clutch in the engaged position by means of an over-centre lever mechanism.
4. Disengage the clutch by the virtually instantaneous collapse of the over-centre lever linkage.
5. Bring about the collapse of the over-centre lever system by means of a "stop" or "trip" rod adjusted axially to abut the saddle at the termination of a threading pass.
6. For the "trip" rod, make use of the existing adjustable saddle dead stop rod.

The Dog-clutch Assembly

I have drawn this in some detail (Fig. 1) because it is adaptable to any ML7 (or with slight modification to the inside base of the headstock, may be fitted to the Super Seven). *To be continued*

'GREENE KING'

A 3½ in. gauge Southern Railway 4-6-0 Class S.15 locomotive

Part XVI

by Martin Evans

From Page 1091

TO CONCLUDE this series on *Greene King*, here are the drawings of the two types of bogie tender, the Urie design and the later Maunsell type as now fitted to the preserved S.15.

As can be seen, the Maunsell type is much easier to make, at least as far as the body part is concerned, as the whole side is completely flat and there is no outward flare on the top edge of the back of the body. The underframes and bogies are identical to both types.

A simple and very strong underframe for the bogie tender can be made using two lengths of 3/4 in. x 3/4 in. x 1/8 in. steel angle. These are bolted to buffer and drag beams of 1 in. x 1/8 in. flat b.m.s. using simple gunmetal castings as shown (which I hope our usual castings people will be able to supply). Failing castings, short lengths of the same steel angle could be used in lieu. Two cross stretchers are then required, which also carry the pivot pins for the bogies; these stretchers are cut from 5/8 in. square steel, and the angles are held to them by four 6 BA bolts at each end; these should be hexagon-head for preference as they will be visible from the outside.

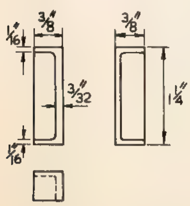
Two short pieces of the 3/4 in. angle will be needed for the drawbar, riveted on the inside of the drag beam; these can be drilled 3/16 in. dia. The cross stretchers are drilled and tapped centrally 5/16 in. x 26t. for the bogie pivot pins, which are simple turnings from 5/8 in. hexagon steel.

The tender bogie wheels are smaller in diameter than those on the six-wheel tenders, being only 2⅝ in. dia. on tread, with ten spokes, but this size should be readily available from any of our usual advertisers. For the bogie frames, 1/8 in. bright mild steel is specified — quite a bit heavier than "scale" but none the worse for that as the extra thickness will be scarcely noticeable on the finished bogies — 2¼ in. wide material will be required. The axlebox slots are 9/16 in. wide and 1 5/16 in. deep and as before, the axleboxes bear partly against the frames and partly against the horns, which are simple gunmetal castings riveted to the frames by five 1/16 in. snaphead rivets each.

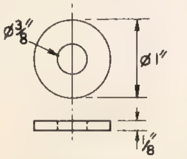
The bogie axleboxes are made from gunmetal castings and are double flanged. As the axles do not need to be too close a fit in their axleboxes, the bores of the latter can be machined with an end mill, or drilled out to about 5/32 in. from the end and finished with a "D" bit. The springs could be castings, but a built-up spring looks a lot better and could be made from nine leaves of 1/4 in. x 1/32 in. tufnol (available from Reeves). The centre "buckle" can be machined from 3/8 in. x 1/4 in. b.m.s., the slot being just deep enough to accommodate the nine spring leaves, which are then clamped in place by the 1/8 in. dia. pin, threaded 5 BA, which also locates the completed spring in relation to the axlebox, the latter being drilled No. 28 drill to receive it.

The bogie sides are now assembled, using the cast centre stretcher shown, and the two end stretchers, which are bent up from 1/16 in. steel strip. Alternatively, the centre stretcher could be built up from steel sections, brazed or riveted together, in which case the centre bearing hole should be bronze-bushed.

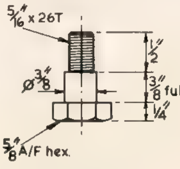
On the full-size Urie tenders, the brake hangers were not slung from pins or brackets attached to the backs of the side frames, but were attached to cross-stretchers. For the sake of simplicity, I have shown the front brake hangers slung from simple turned pins bolted to the side frames, but the rear hangers are slung from brackets riveted to the end stretchers, in a manner very similar to the prototype.



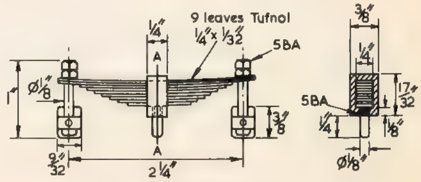
BOGIE HORN: 16 off g.m



WASHER for PIVOT PIN
2 off brass



BOGIE PIVOT PIN
2 off b.m.s.



BOGIE SPRING: 8 off b.m.s.

Sect. AA

Now for the bodywork. The soleplate for both Urie and Maunsell bogie tenders is a plain flat rectangle, cut from 1/16 in. hard brass, and the sides and ends are attached to it in the usual way, with brass angle about 1/4 in. x 1/4 in., although somewhat larger angle may be preferred as we are dealing with a very long tender. The sides and ends of the Maunsell tender are plain flat pieces with half-round beading around the top edge. The Urie tender body however is a different kettle of fish, as the coping is flared out, both on sides and end, while the corners between sides and end, seen in plan, are well radiused.

To those inexperienced in sheet metal work, I would suggest that two pieces be used, the side and half of the back being bent in one piece, so that we get a vertical joint in the middle of the back, which can have a cover strap on the inside, as in boiler work; it will not be seen as the removable top deck will cover it. The coping could be made from separate strips, soft soldered in position. The problem is what to do about the corners. Owing to the large radius between side and back (in plan) the flared coping pieces will not meet, and there will be a gap here. However, once the sides and back have been erected, it should not be too difficult to cut out a small filling piece — this could be in thin gauge copper which is easier to anneal and bend — afterwards soft soldering this in position. After a good clean-up with scrapers, the result should not look too bad. Incidentally, it is a good plan to cut out a dummy side and back piece in thick cardboard and offer them up to see what is involved over the corners; this might save spoiling valuable metal!

The valances on the Urie tender can be made from 3/16 in. square brass or angle; as we need the ornamental shaped ends, perhaps the square bar will be more convenient, the end pieces being cut from a length of 1/2 in. x 3/16 in. brass, and silver soldered to the 3/16 in. square part. The complete valances can be fixed to the soleplate by 1/16 in. countersunk copper rivets, at about 2 in. centres. If these are put in from the soleplate, they can be hammered into countersinks in the valance, which will avoid marking the soleplate.

On the Maunsell tender, we have a rather easier valance, of 5/32 in. square section with no ornamental ends, but the steps on the Maunsell tender are quite different, they are in fact similar to those on the six-wheel tender described previously, and are fitted just at the back of the valance, to which they are best silver-soldered, otherwise they are likely to get broken off in service. They will also need strengthening at the back, with a piece of brass, say 1/16 in. thick, on edge, butting up against the frames.

A look at the plan view of the Urie tender shows that there is a short extension at the front end of the side-plate, so these can be cut out separately and fixed to the soleplate by short pieces of the 1/4 in. angle, the vertical edge being soft soldered to the radiused end of the side plate.

As the tank is so long on the bogie tenders, at least three vertical "bulkheads" are suggested, these being drilled with a few large holes near the bottom edge to allow the water to circulate. The top of the tank, which we might call the deck, is made in a similar manner to the six-wheeler, with a large removable piece to the rear of the coal retaining plate, to give access to the hand pump, etc. The removable piece will have the usual water filler, though to be correct to the prototype, there should be two of these, as shown on my drawing. They should have removable filters, made from fine copper gauze, in the top of each, as one cannot be too careful in keeping out foreign bodies from the feed water, especially if injectors are being used.

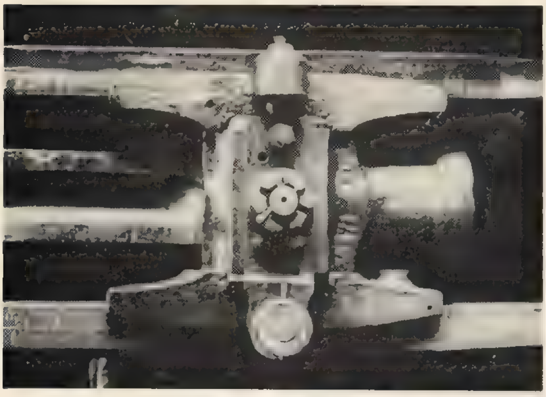
The two injector water valves are as described for the six-wheel tender, and these are supplied with removable gauze filters as shown. The 5/32 in. dia. pipe carrying the water from the hand pump connection to the union under the fall plate will be long enough to ensure sufficient flexibility without any extra "coils", and it will be prevented from dropping and fouling the track when disconnected by the fact that it lies just above the brake cross-shaft at the front end. Which brings me to the brake gear. On the Maunsell tender, the usual type of vertical screw and standard was used, but on the Urie tender, a rather unusual arrangement was used, involving a wheel on a short horizontal shaft carrying a small bevel gear, this meshing with a similar bevel gear on the shaft carrying the screw. Unfortunately, I was unable to obtain any official drawings of this component, but I imagine that the bevels were of equal size and number of teeth, in which case, anyone wishing to copy the arrangement could use the bevels as supplied for the reversing gear of the 3½ in. gauge *Britannia,* and also *Evening Star.* Given the position of the screw shown on the plan drawing, there should be just enough room for it to clear the right-hand injector water valve.

As I mentioned in the last *Greene King* article, the Urie bogie tenders had a simple gravity sanding gear, feeding sand in front of the leading wheels; but I doubt if many builders will want to bother with this, although I have shown the position of the sandboxes. They were fitted on each side, hard against the side extensions mentioned earlier.

Finally, a brief word on the livery of the Maunsell S.15 class engines. They entered traffic painted black, but at their first general repair, they were repainted in the standard passenger livery, the green being the darkish olive green with black and white lining. From the outbreak of war in 1939 up to about February 1941, the olive green was continued

but without any lining. From 1941, most of the class were painted in unlined black, though a few received the new lighter green, sometimes called Malachite green, again without lining. On nationalisation, all S.15s were painted unlined black with large yellow numerals on the cab side and the British Railways "lion" emblem on the tender sides. *Greene King* himself has of course been repainted in the full passenger style, with Malachite green on boiler, cab sides, valance edging and cylinders, with black and white lining. The tender is also in green with black and white lining around the edges, and lettered Southern with the number, 841, underneath.

Greene King's Valve Gear



Details of "Greene King's" valve gear.

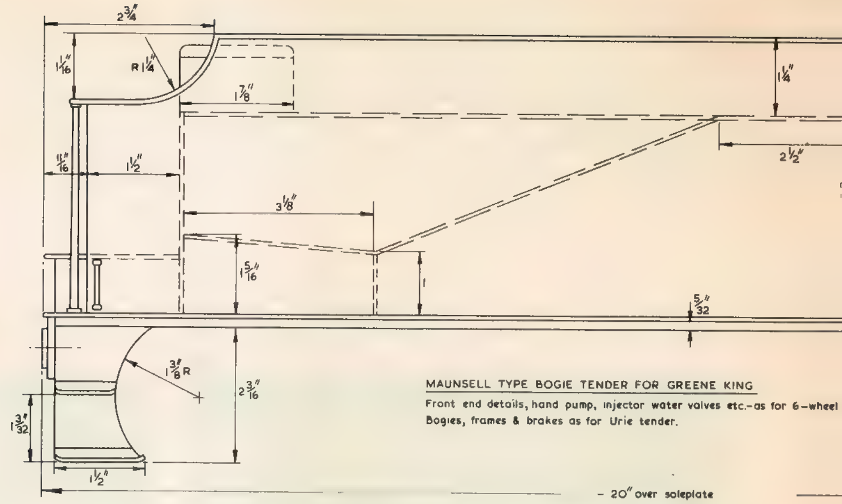
Top left: The right hand crosshead.

Left: View from the rear driver of the con. rod big end.

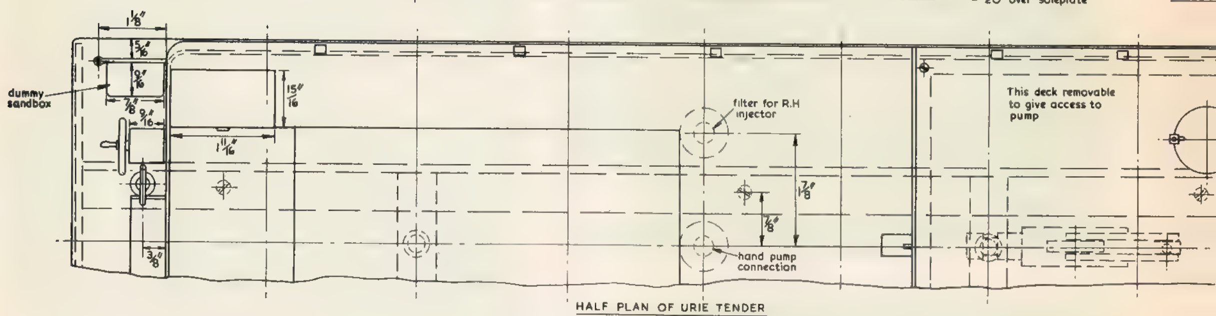
Below: The return crank and eccentric rod big-end.

Photos by Malcolm Root at Norwich Motive Power Depot, reproduced by courtesy of the S.15 Locomotive Society.

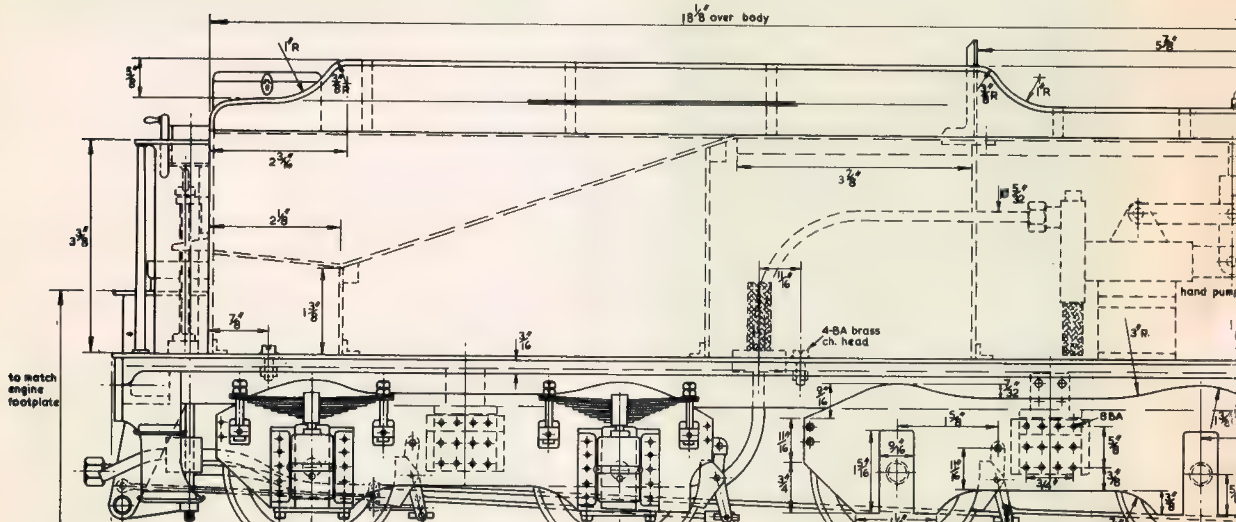
Above: The weigh-shaft bearing on a "King Arthur" — very similar to that of "Greene King".



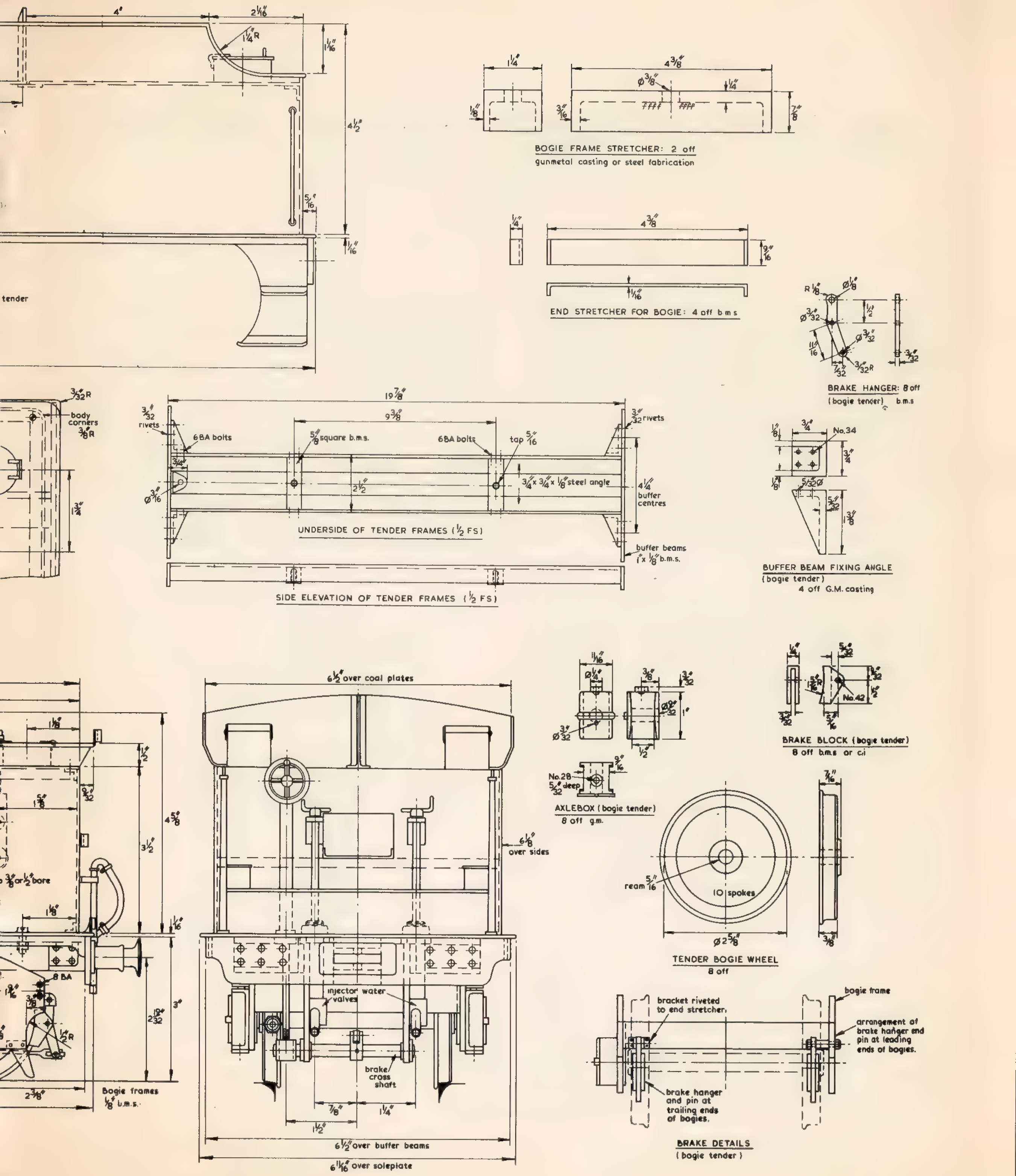
MAUNSELL TYPE BOGIE TENDER FOR GREENE KING



HALF PLAN OF URIE TENDER



GENERAL ARRANGEMENT OF URIE BOGIE TENDER


BOGIE FRAME STRETCHER: 2 off
gunmetal casting or steel fabrication
END STRETCHER FOR BOGIE: 4 off b.m.s
BRAKE HANGER: 8 off
(bogie tender) b.m.s
UNDERSIDE OF TENDER FRAMES (½ FS)
SIDE ELEVATION OF TENDER FRAMES (½ FS)
BUFFER BEAM FIXING ANGLE
(bogie tender)
4 off G.M. casting
6BA bolts
5/8 square b.m.s.
tap 5/16
3/4 x 3/4 x 1/8 steel angle
4¼ buffer centres
buffer beams 1 x 1/8 b.m.s.
3/32 rivets
body corners 3/8R
BRAKE BLOCK (bogie tender)
8 off b.m.s or c.i
AXLEBOX (bogie tender)
8 off g.m.
No.28 5/32 deep
TENDER BOGIE WHEEL
8 off
ream 5/16
10 spokes
6½ over coal plates
6⅛ over sides
injector water valves
brake cross shaft
6½ over buffer beams
6 11/16 over soleplate
Bogie frames 1/8 b.m.s.
bracket riveted to end stretcher
bogie frame
arrangement of brake hanger end pin at leading ends of bogies.
brake hanger and pin at trailing ends of bogies.
BRAKE DETAILS
(bogie tender)

THE PISTON DROP VALVE ENGINE

by A. Haworth

Part VII *From page 1163*

THE SUB-ASSEMBLY drawing of the half crankshaft side of the LP engine is almost a mirror image of the HP side. As will be seen a trifle more room is available in the vicinity of the gears and which is largely due to the disposition of the LP layshaft which is in a straight line up to the cylinder.

The exhaust eccentrics both of which, the HP and LP, are identical are secured to the main shaft by locknuts. The half throw is 3/16 in., giving a full travel of 3/8 in. The two half straps are held to the sheave by two No. 4 BA screws. The end of the eccentric rod is suitably screwed into the half strap boss and locknutted.

A 'Porter' type governor has been chosen mainly because it shows intimately the working of every part of the governor in action. It will be said that the Whitehead is a more efficient and sensitive governor and I agree, but little can be seen of its action. Besides, many, many full-size engines were efficiently governed by Porter governors. It is admitted now that the governor is a trifle oversize relative to the scale of the engine. This is intentional, if it were any smaller it simply would not govern. It would become an ornament. There are many such ornamental governors on model engines.

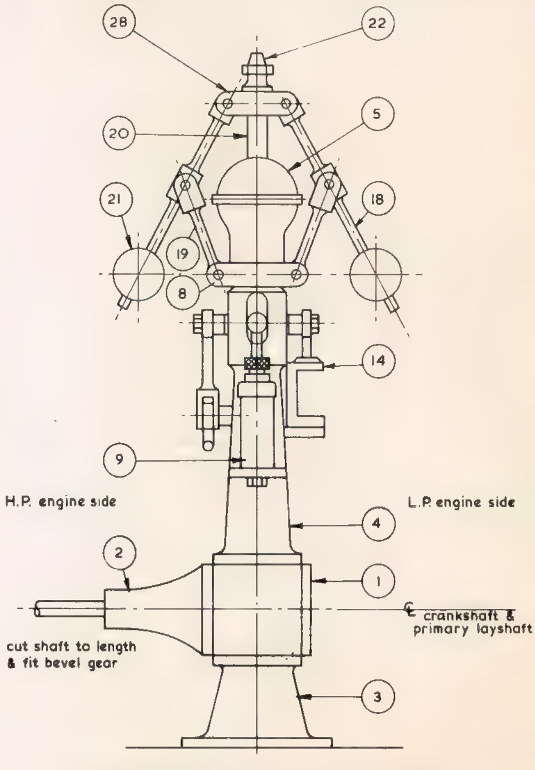
Paintings of bunches of grapes on the side of the cylinders are also attractive. A governor should be regarded as a piece of scientific equipment rather than as a lump of hardware. And they should be constructed and treated as such. It is no job for a beginner. Even a perfectly constructed and sweetly running job requires much initial adjustment.

The basic construction is composed of stand, housing, column and shaft bonnet, with the ball flight. The housing is basically a hollow steel cube and is, as it were, the keystone. The column is screwed into the top of the housing. The stand is screwed into the bottom and the shaft bonnet into the side. This structure holds all the "gubbins". The rise and fall of the governor sleeve under the governor will:

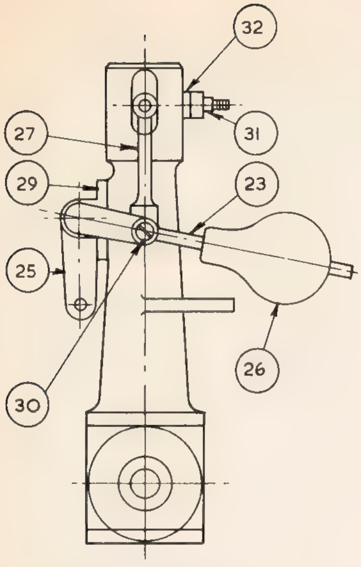
1. Move the governor lever and so activate the engine steam valves via the linkage.
2. Operate the damping piston in its cylinder to produce a "cushioning" effect, thereby inhibiting "hunting".
3. Render the governor inoperative by tripping the safety latch.

It is seen that each detail has been itemised by a number.

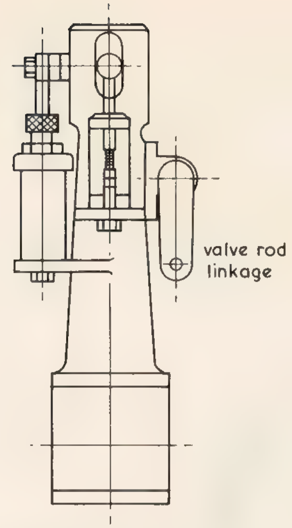
These numbers also appear on the arrangement drawing of the governor itself. The system has a two-fold advantage, we can immediately see where every "bit" lives and we can talk about it even on the telephone by referring to item 7, sheet 2. We are then immediately aware that he is babbling about



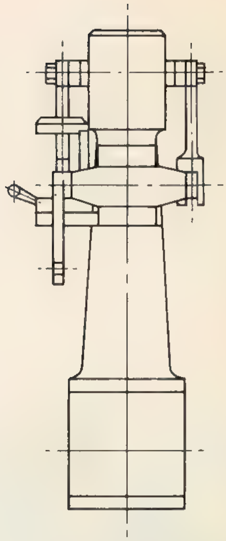
SUB ASSEMBLY OF PORTER TYPE GOVERNOR
LOOKING TOWARDS FLYWHEEL



LOOKING TO FLYWHEEL FROM H.P. CRANK



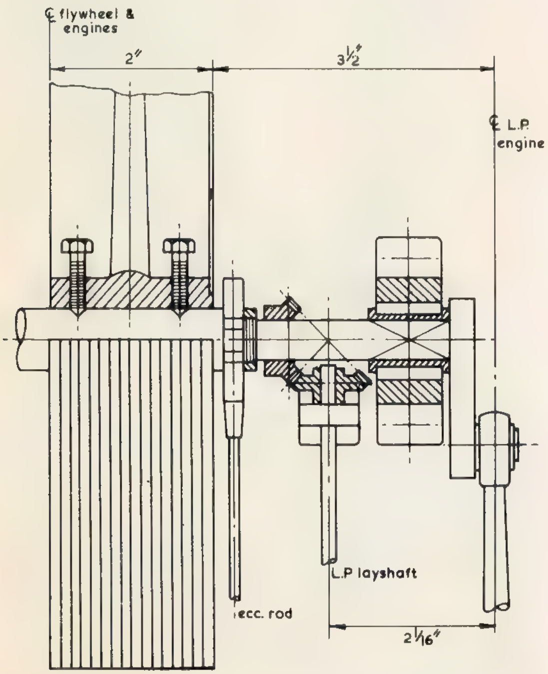
LOOKING TO H.P. CRANK FROM FLYWHEEL



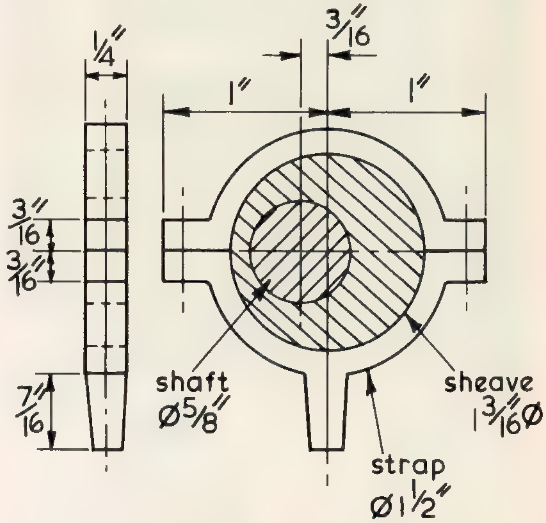
LOOKING TO FRONT CYLINDER COVER

the "woggle that sniffles up and down in the gimbal". I have endeavoured, where possible, to break the construction down into a series of sub-assemblies. My advice is to make these sub-assemblies or you have a pile of hardware, wondering where to start. As I have previously stated, spend a week just studying the drawings and assemble the governor in your mind before ever reaching for a tool.

In the next section, part two of the governor instalments, is shown the spool and damper sub-assemblies. You will not see what the complete



SUB-ASSEMBLY HALF PLAN ON CRANKSHAFT SIDE OF LOW-PRESSURE ENGINE



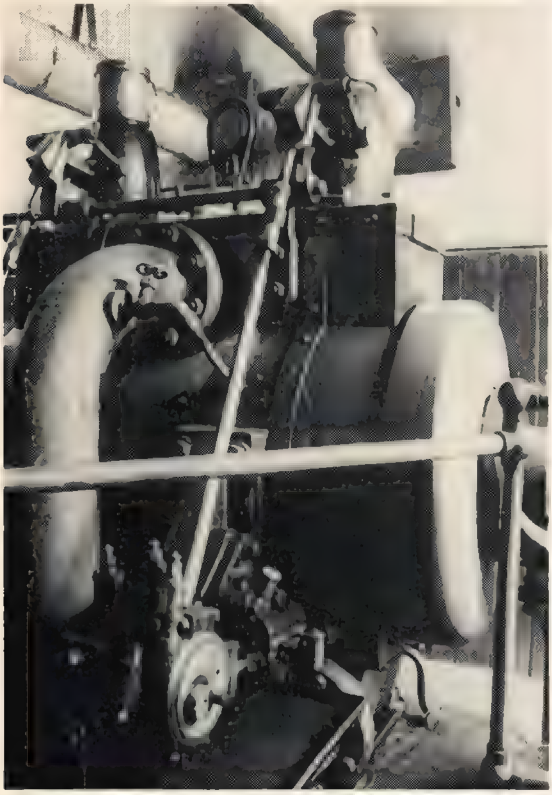
SPIGOT & GROOVE
SHEAVE & STRAP
sheave — b.m.s.
strap — g.m.

EXHAUST ECCENTRIC

governor looks like until you start to assemble it from the arrangement.

First, the spool assembly, it consists of our items and the drawing makes it perfectly clear almost like "Meccano". Its principal purpose is to act as a counterbalance to the ball flight whose centrifugal action causes it to rise or fall. It will be obvious that the whole assembly fits on the vertical rotating shaft. The sleeve, however, although free to rotate does not do so. It simply rises or falls. Into it are fitted the three pins which carry the valve lever rod, the damper piston rod and the latch rod on the outside of the column.

The second assembly, that is the damping cylinder, consists of five separate items. Its main purpose is to "damp" out the oscillations that occur due to cyclic variations in engine speed. That is to say it prevents "hunting". This is a condition that can occur with a "sticky" governor. In other words, a slight variation in engine speed produces an immediate response from the governor, which immediately affects the engine speed, which immediately . . . and there you are, all over the place. Engineers have been known to foam at the mouth!



With the "Whitehead" governor, a later improvement, this damper was incorporated within the spindle and hydraulically operated. The spool was replaced by a spring but, as already stated, nothing could be seen. This is the reason I chose this type of governor. It is always well to remember the engineer's famous maxim, "A sloppy governor will govern sloppily, a tight one not at all".

To be continued

Left upper and lower: Another horizontal cross compound at Springbank Mill, Dunblane. Built by Robey and Co. at Lincoln in 1927 with double beat drop valves on inlet, grid iron slide valves on exhaust. Photographs by Mr. G. Hayes.

Below: A horizontal cross compound at Coldharbour Mill, Devon. Built by Pollit and Wigzell of Sowerby Bridge in 1910, this engine has 13 in. dia. HP and 26 in. LP × 36 in. stroke cylinders with piston drop valves on inlet and Corliss valves on exhaust.

A SETTING BAR FOR FIXED AND TRAVELLING STEADIES

by Arnold Throp

FIXED AND TRAVELLING STEADIES are both important lathe accessories because certain kinds of not-so-unusual operations are almost impossible without them. Long components may impose unreasonable loads on chuck jaws, simply because of their weight, or because of cutting forces. If they are hollow, it may be possible to plug the ends and give support by the tailstock centre. But this is not feasible if the work to be done is internal, as in drilling or boring an axial hole. Support must then be given by a steady on the outside surface.

If the work is solid material, not hollow, it may well be necessary to support it in a steady while a centre is being drilled to permit the tailstock to support it eventually. Travelling steadies which run just in front of the cutting tool are necessary when dealing with slender pieces which either chatter or bend away hopelessly from the cutting tool.

With both fixed and travelling steadies there is one common problem, viz. how to set the fingers which contact the work so that they are all equidistant from a line in space joining the centres of the lathe. Steadies used in small lathes usually have only two fingers on the travelling type, as the thrust of the tool pushes the work into the angle between these. Fixed steadies may have either 3 or 4, 3 being the minimum that can provide location.

On the larger diameter workpieces like boiler shell tubes, three is not entirely satisfactory, as the tubes are relatively thin and flimsy, which is why I designed a four-point steady some years ago, and this is now produced by Model Engineering Services. This will accept work from 1/4 in. to 5 in. diameter, but it still has the inherent setting problem.

Setting the fingers from the work itself is not generally easy, because however carefully one gets it running true at the chuck end, it will almost certainly be out at the other end. If one sets the fingers to work which is out in this way, it will tend to wrench itself out of the chuck by reason of its rotation as the operations proceed.

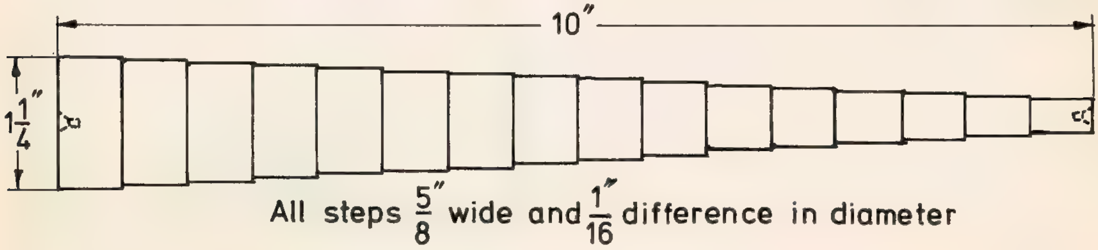
It would be possible to devise a mechanism in which a three or four lobed cam would move all the fingers in correct relation to each other, and articles of this kind are not unknown in industry. But the problems of making such things in the home workshop are far beyond the skills of all but the most experienced technicians, and the time consumed would be unrealistic for the ensuing benefits.

Fortunately a very much simpler solution is now available, not extravagant in either material cost or time, and involving only plain turning that anybody with a lathe can do.

The article required is just a stepped mandrel, turned between centres to a number of specified diameters, as shown in Fig. 1. Once this is made, preparation for dealing with, for example, a long piece of bright mild steel is very simple.

The mandrel is put between centres in the lathe. The steady (of any of the three types) is fixed on the saddle or loosely on the bed, and moved along until it is over the correct diameter on the mandrel, the fingers are brought into contact with it, clamped, and they are set correctly. The mandrel is removed, and the fixed steady, if being used, is then moved to the place on the bed where it suits the length of the work. The travelling steady, of course, is fast on the saddle and moves with it.

At the chuck end the work may have to be set true in a four-jaw chuck. Because of the fact that chuck jaws, especially on worn chucks, rarely point



SETTING MANDREL FOR LATHE STEADIES

FIG. 1

Fig. 2

the work in quite the true direction, it may be necessary to run with the jaws clamped up just enough to provide the driving torque allowing the work to "give" a little in the jaws.

Fig. 2 shows the jaws being adjusted on the mandrel for a fixed steady, at 7/8 in. diameter. Now two questions are likely to be asked. How does one deal with bright drawn bar, which is liable to be as much as three thou under nominal size, and how can one cope with boiler shell tubes which are likely to be much larger than a reasonable mandrel could be?

Taking the bright steel first, if each step of the mandrel is turned say three thou below the nominal size the resultant setting of the fingers will in most cases be about right. But if the steel is up to size, and *ground* bar very likely would be, then the fingers will be found to be adjusted too tight. This can be overcome by wrapping a bit of thin paper round the mandrel when setting them. This paper will be found somewhere in every household, and it is a good thing, when it is available, to lay in a little stock for workshop purposes.

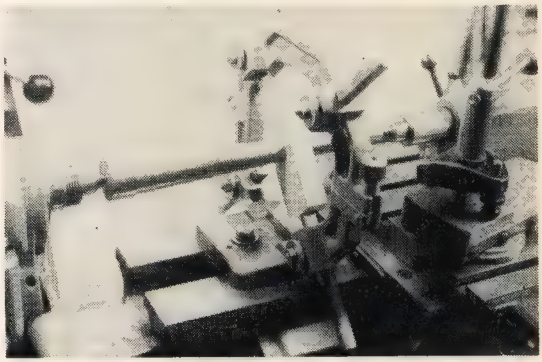
Newspaper is about three thou thick, but typing carbon copy paper is thinner, and Geo. Thomas has recommended cigarette paper, which seems to be about one thou. So there is a reasonable choice of thin materials around. Some of the smoother toilet papers are under two thou.

To deal with boiler tubes one needs to increase the diameter of the mandrel very considerably, but this is readily done by boring a hole in a piece of wood, pushing it on the mandrel somewhere, and skimming up the outside of the wood to the required diameter. It is not necessary to have a complete disc of wood, a fairly narrow piece will serve, if the ends can be turned to the size needed, and Fig. 3 shows such a piece in use setting a four-point steady.

This same method can be used to deal with any piece of metal that is a "bastard" or in-between size. It may be a piece which has had an external turning operation that results in a diameter that is not any size provided on the mandrel. Just turn up a bit of wood or a piece of scrap metal to make an off-standard diameter.

While this stepped mandrel as described can be made out of almost any piece of round steel bar, one of the quite modest size shown takes a fairly long time to turn, and produces quite a large pile of swarf, using up what is now rather costly metal. I happened to have a short end of 1¼ in. diameter available for the purpose, and while the lathe was plodding away churning off the excess I was doing other jobs, so that the time was not too important. But it is not really necessary for it to be made of

Fig. 3



steel bar, and high grade cast iron is suitable provided that it is never dropped small end down on a concrete floor!

Although I have seen one or two stepped mandrels in engineering shops used for turning wheels, flanges, bushes, etc. I have never seen one used for setting steadies, and a number of engineering friends have confessed they also have never seen *any* appliance made for this duty. But I believe this absurdly simple appliance will be of great benefit to model engineers, who have to do on one machine the many operations that in commercial workshops get distributed among a variety of machines, perhaps more specialised yet perhaps more versatile.

A slotting attachment — Arnold Throp's next project.

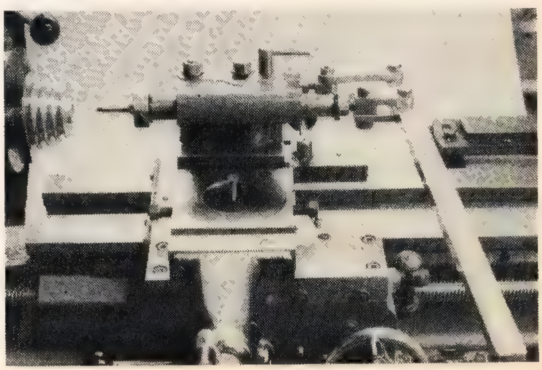
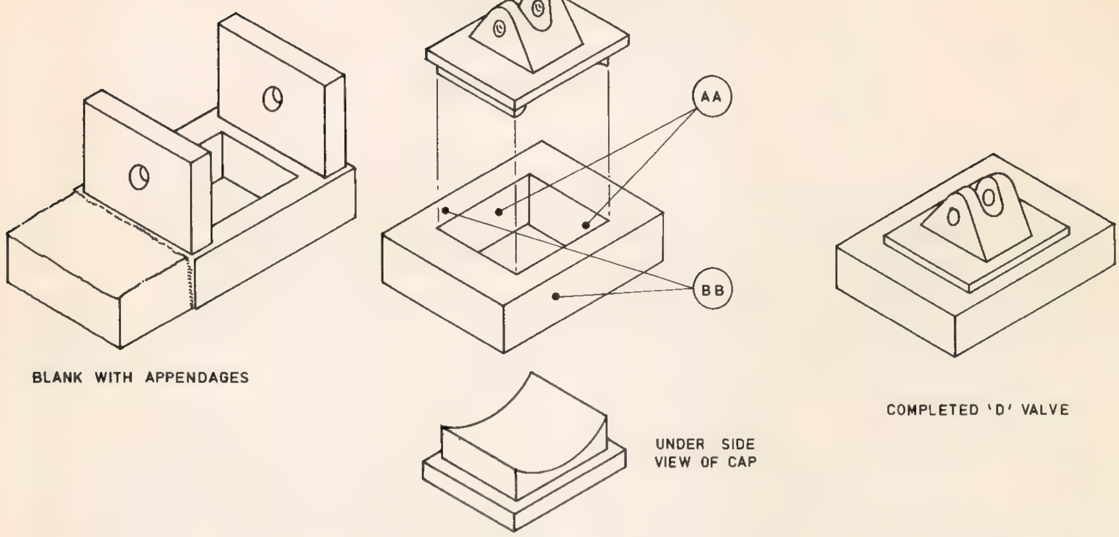


FIG. 2

VALVE SPINDLE ANCHOR CAP



angular positions of these primary events in relation not only with the respective crank webs, but also with the centre line of the valve spindles through the engine bed pointer.

With each blank mounted on its temporary valve spindle, the job now became one of repetitive tediousness, whilst carefully whittling away at those four faces AA, and BB, of the valve blanks, in order that the sequence of primary events occurring on each valve port face should synchronise with what was happening at the protractor end of the job.

You must make certain that in bringing the engine to (for example) "Steam port just cracking

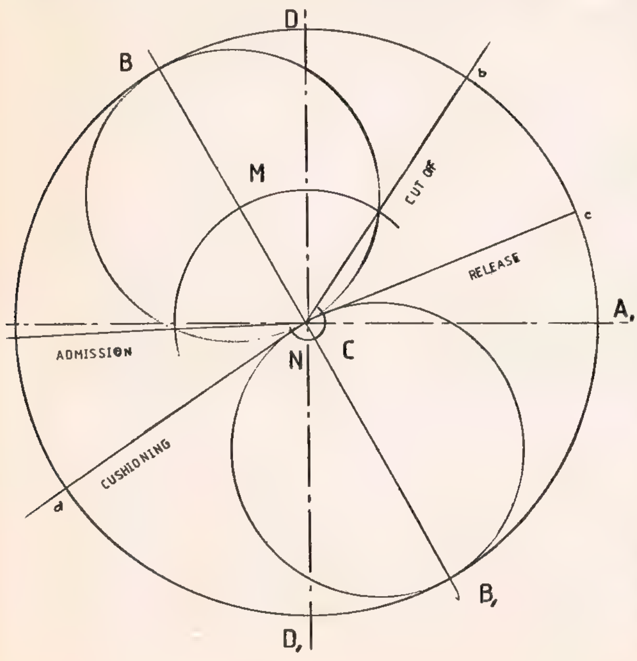


FIG 3

LINE ACA, VALVE TRAVEL
ANGLE BCD ANGLE OF ADVANCE (HCE)+
LINE BCB, CENTRE LINE OF TWO CIRCLES OF DIAMETER AC
ARC M VALVE LAP - STEAM (KC)+
ARC N VALVE LAP - EXHAUST (if any)
LINE aC cuts intersect of M with upper circle
LINE bC cuts intersect of M with upper circle
LINE cC cuts intersect of N with lower circle
LINE dC cuts intersect of N with lower circle

ANGLE of	ADMISSION	ACa	357°
ANGLE of	CUT OFF	ACd	122°
ANGLE of	RELEASE	ACc	157°
ANGLE of	CUSHIONING	ACb	327°

+ see modified Zeuner diag. in last article

HOLMSIDE AND SOUTH MOOR COLLIERY

Part VIII

by E. Cheeseman

From page 1031

USING THE empirical formula shown in Fig. 1, and using my already calculated steam port width of 3/32 in., the two cylinder valve faces were carefully marked out, and milled in the conventional manner. This of course was followed by the usual drilling out of steam and exhaust passages; the axiom here, being as straight and as large as possible: there being no danger of making the steam passages too large on this model.

Next came the whole crux of this "Suck it, and See" method of valve gear design: the making of a matched "D" valve for each cylinder valve face. In the making, I hoped to mop up all of those unintentional, as well as deliberate deviations from the ideal valve gear proportions.

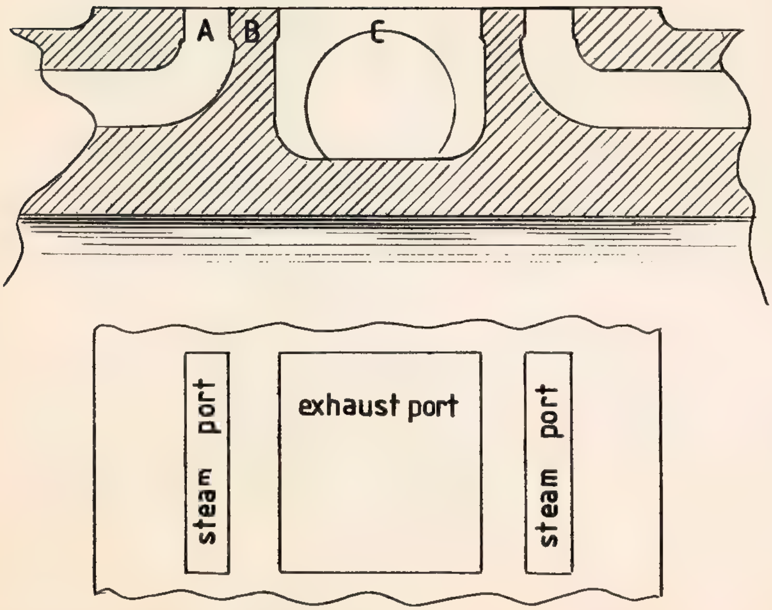
From bits of scrap phosphor bronze, two blanks were made, Fig. 2. The main characteristics of these blanks were as follows:

1. An extension for holding blank firmly in the vice during filing operations to be undertaken.
2. Plenty of metal left on the faces AA, BB, Fig. 2.
3. Temporary lugs to which the temporary valve spindle could be solidly secured.

Another visit to the drawing board now became urgent.

Using the same scale as my previous modified Zeuner diagram (previous article), a full version was drawn out, as in Fig. 3. From this diagram, I was able to mark out on my 360 deg. protractor which was secured to the engine crankshaft, the angular positions of the commencement of the four primary steaming/exhausting events, namely: admission; cut-off; release; cushioning.

These points of reference on the 360 deg. protractor were marked off from a datum pointer mounted from the engine bedplate, and needed to be timed, or made co-incidental with the crank web positions, using once again two of those Allen key pointers which I had made earlier, so now I had the



A steam port width

B $A \times 0{\cdot}9$

C $\frac{T}{2} + A - (B - Le)$

T Valve travel

Le Exhaust lap

FIG 1

open", that you *always* approach the point with the engine rotating in the same direction as the gear which is selected, i.e., forward for forward gear, backward for reverse gear, and quite obviously full gear positions must be used. Should you overshoot the position, do the same as when you overshoot with the feed on your lathe, take it back half a turn, and approach the position from the same direction.

I always work on all faces together, i.e., bring them all to say within 10 thou, then all to within 5 thou, and so on. Of course if you overshoot with one, then get cracking with another blank.

With no steam chest walls, and an open, or skeletonised valve with the help of a magnifying glass the position of the valve in relationship to the port face can be accurately observed.

When I was satisfied with everything, those temporary lugs and vice holding appendages were removed, the remaining faces were "casually finished" before fitting the previously-made permanent valve spindle anchor caps. These items were made from the same phosphor bronze which I considered a must, in order to obviate different metals coefficiencies of expansion.

These two pieces were in fact soft soldered together, for this joint will have no operational stresses to withstand, the solder acts purely as a sealant. Unless one intends to run an engine fitted with such valves on superheated steam, the temperature of which is greater than the melting point of solder, why go for anything "fiddlier".

The "D" valves were finally machined and lapped on their faces, and as the engine will not be run at high speed with corresponding inertia problems no further metal was removed from the non-critical faces. The steam chests and permanent valve spindles were now fitted.

Up to now, I had kept the two sides of the winding engine separate, as far as the two reverse gears were concerned; however, I had frequently given the two gears comparative and corrective checks all along the line, so it was no surprise after the two were connected together by the main cross-shaft, to find that both gears took up the three critical gear positions in harmony. I was not faced with drawing out rods and bell crank levers, etc. of either one side or the other.

With the two gears connected to the cross-shaft and Forward/Reverse lever, the final chore was cutting the detent notches in the quadrant in the positions dictated by full Forward, full Reverse, and Mid Gear.

Making sure that everything was O.K. by trying the set-up out on compressed air, I was pleased to note that despite the absence of any flywheel, or rather rope-drum, I had a smooth-running engine on my hands.

All that remained was to dimple the crankshaft for the Allen screws retaining the eccentric sheaves, and crank webs, before stripping the whole lot down again, ready for the final polishing, painting, fitting of cylinder lagging, and erecting.

To be continued

CLUB DIARY

Dates should be sent at least five weeks before the event to ensure publication. Please state venue and time. While every care is taken, we cannot accept responsibility for errors.

NOVEMBER

3 Romford M.E. Club. Competition night.
3 Stockport & District S.M.E. Bits and Pieces. Parish Hall, Cheadle Hulme.
3 S.M.E.E. Annual Dinner, Piccadilly Hotel.
3 The Model Engineers Society. Monthly meeting. Cregagh Library, Cregagh Road, Belfast. 7.30 p.m.
3 Bedford M.E.S. Illustrated talk on "The Shuttleworth Collection" by David Ogilby. Bedford Town Library. 7.30 p.m.
3 Rochdale S.M.E.E. Technical College, film night.
3 Dublin S.M.E.E. "Building a Clinker-built Steam Launch". T. O'Dea. Star of the Sea School, Sandymount, Dublin 4. 8 p.m.
3 Vale of Aylesbury M.E.S. Questions and Answers on Boiler Making. Jubilee Hall, Bierton, Aylesbury. 7.30 for 8 p.m.
4 Huddersfield S.M.E. Bonfire night with fireworks.
4 Ickenham & District S.M.E. Public track running. Rear of Coach & Horses, Ickenham. 2-6 p.m.
4 S.M.E.E. Talk — A sense of proportion — Prof. D. H. Chaddock, C.B.E.
4 Birmingham S.M.E. Bonfire night celebrations.
4 Chesterfield & District M.E.S. Pea and Pie night. Track — Hady.
4 Huddersfield S.M.E. Bonfire supper as last year.
5 Vale of Aylesbury M.E.S. Site work at Quainton Road Station. 10 a.m.
6 Leicester S.M.E. Meeting (Subject to be decided). Royce Institute, Crane Street, Leicester. 7.30 p.m.
7 Guildford M.E.S. Executive Committee Meeting.
7 S. Cheshire M.E.S. AGM. Victoria Hotel, Crewe. 7.45 p.m.
8 Norwich & District Society of M.E. Meeting — Assembly House, Norwich. Subject to be announced. 7.30 p.m.
8 Southampton & District M.E.S. General Meeting. Malvern Hotel, Winchester Road, Southampton.
8 Harrow & Wembley S.M.E. General section.
8 Cannock Chase M.E.S. Members' slides. Meeting Lea Hall Club. 7.30 p.m.
9 Leyland, Preston & District S.M.E. Meeting at Roebuck Hotel, Leyland at 8.00 p.m.
9 S.T.C. (Paignton) M.E.S. Athletic & Social Club, Brixham Road, Paignton. 7.30 p.m.
9 N. Wales M.E.S. An illustrated talk on the British canals that have become so popular over the recent years. Speaker to be announced.
10 Thames Shiplovers' and Ship Model Society. Research for Model Makers by Anthony Preston.
11 S.M.E.E. Rummage Sale.
11 N. London S.M.E. Firework display. Colney Heath.
11 Stafford & District M.E.S. Visit to Transport Museum — York. Leave County Showground 8.00 a.m.
13 Wirrall M.E.S. Film — Building old Liverpool — J. Johnson. Victory Hall, Upton, Birkenhead. 7.30 p.m.
13 Clyde Shiplovers' and Model Makers' Society. SS "Uganda" — Departure Glasgow — Paul Strathdee. Partick Halls, Burgh Hall St., Glasgow. 7.30 p.m.
13 Bedford M.E.S.. Building Model Railways. Talk by D. Gladstone, Clubhouse, Wilstead.
13 Worthing & District M.E.S. Informal evening, Broadwater Parish Room. 7.30 p.m.
13 King's Lynn & District S.M.E. Monthly meeting. St. James School, London Road, King's Lynn. 7.45 p.m.
14 Basingstoke & District M.E.S. Meeting Night.
15 Birmingham S.M.E. 8 mm Film Competition at Ilshaw Heath.
15 Guildford M.E.S. Bits and Pieces competition. H.Q., Stoke Park. 7.45 p.m.
16 N. Wales M.E.S. Grand Auction — under the hammer of Ken Webber. Items you would like included in — let Committee know.
16 The Nottingham Soc. of M.E.E. Auction. The Friend's Meeting House, Clarendon Street, Nottingham. 7.30 p.m.
16 Rugby M.E.S. Annual General Meeting.
16 Hull S.M.E. Clock parts — talk by K. Nicklas.

THE NEW STAINES SOCIETY PERMANENT TRACK: A HISTORY

by Ron Slade

IN COMMON WITH many Societies, Staines has always considered one of its priorities to have a permanent locomotive track situated in idyllic surroundings. Though the Society was formed in 1945, it was 1946 before the Live Steam Section came into being, mainly because of the many calls made on the society to appear at local fetes, etc., these proving so popular and regular that some sort of organising and control was obvious. In the meantime, much burning of the midnight oil, Club meeting discussions and working parties had resulted in a portable track of 100 feet in length being constructed, and this did yeoman service. It proved so popular that a second track was constructed incorporating improvements thought necessary, learnt from Mark I. In fact, Mark I we still have in use — Mark II must have been better for it mysteriously disappeared from a member's back garden!

It was due to these portable tracks that the urge to build a permanent track gradually became an obsession. Meetings were spent in arguing the pros and cons of the perfect track, and spies were out everywhere peering over fences and walls looking for the perfect site. How young and innocent we were in those days! However in 1955 we did find what we thought would be an ideal site and application was made to the local Council.

Without going into detail, this eventually fell through and we were offered an alternative site on the opposite side of the road which also seemed ideal. If acceptable, would we submit a detailed plan of what we intended? Not half we wouldn't! More midnight oil was burnt, and meetings spent in designing the superstructure and utilising to the last half inch the space available.

This plan was duly submitted and to our surprise accepted first time, and the legal document complete with the seal of approval duly arrived. What a day that was. A hut was donated and erected on site and preliminary marking out commenced. What a happy band we were. But not for long!

One morning a couple of Mr. Chadds appeared over the top of the fences of the gardens backing onto the site. "Ullo, Ullo, what's going on 'ere then?" A detailed explanation brought forth "Oh is it — we'll see about that. We are not having our peace and quiet disturbed by that lot." To our way of thinking this did not auger well for the future, and after much heart searching the decision was made. Drop the whole idea, for if this was the attitude before we had even started we could not visualise things getting better in the future. As I said before, we were young and innocent in those days.

As it turned out those objectors did us a good turn, for a couple of years later a new roundabout and bypass would have bulldozed us off anyway. All attempts to find an alternative site came to nought and the matter stayed in abeyance. Then, like a lot of societies in the early 'sixties we caught the dreaded TV disease. Membership dwindled and a handful of stalwarts kept the society alive, but only just! Eventually, as it always does, events turned the full circle, TV became a bore and interest in a worthwhile pastime became the order of the day.

One day the phone rang and a voice enquired if I was the secretary of the Staines Society, and was it still in being? An explanation of the situation brought the plea "Can't we get it going again?" "Sure," I replied, "I'm all for it, but you'll have to find a new sec." After 30 years I felt I'd done my stint. So, under the capable guidance of the enquirer, Roy Matthews, and a new Committee, club activities took on a new lease of life, and of course before long again came the cry for a permanent track. Out went the spies again and eventually news filtered through that the local Council were commencing to lay out a new park on the Commercial Road. An approach to them was made and they were as happy with the idea as we were, as they were considering all amenities to improve the park.

Unfortunately at this point in time our new Secretary moved out of the area and could not give enough of his time to all the organising involved. We were indeed fortunate that Vic Hotchkiss stepped into the breach and has proved to be a first-class organiser and Secretary. So, plans were drawn up and submitted — accepted — and an agreement drawn up and signed by all parties. We were in business.

Out came the midnight oil again and at meeting after meeting the pros and cons were discussed, all suggestions closely examined and collated along with the Committee's findings.

A talk by Mr. Lawrence with a range of colour slides on the building of the Bournemouth track was a great help. Eventually the happy day arrived

when we had all the answers — or so we thought. Up went the cry — let battle commence, and on Sunday mornings and Wednesday evenings a working party began digging holes in the greensward of a lovely new park. That did it! Out came the householders from the houses on the other side of the road, "Ullo, Ullo, what's going on 'ere then?" Here we go again, I thought.

But this time we were a little older and wiser, and careful public relations averted another crisis. Detailed explanations of what it was all about worked wonders, and I'm happy to say those good folk are now our allies, even keeping an eye on the track when we are not in attendance. One very sympathetic gentleman even donated £10 towards the cost, another donated a heap of hardcore and another is keeping a cine record of our activities with a promise of a show one evening at a meeting. No doubt about it; this time we were in!

It had been decided that the track should be constructed with a concrete base let into the soil, so the first job was to mark out the centres of this. You will see from the plan that one long straight forms one side, so the decision was made to construct this section first to give us something to run on while the curves were constructed. Holes were dug at five-foot centres, wooden frames made up and laid in position.

The heavy gang were soon mixing the concrete and this was thoroughly puddled down leaving holes for fixing down the A frames. Moulds were made up for these A frames so that ten could be cast at a time, and proved to be most effective. A big vote of thanks here to the Council for allowing us to use a corner of their yard for storing and concrete mixing, especially as it's just across the road.

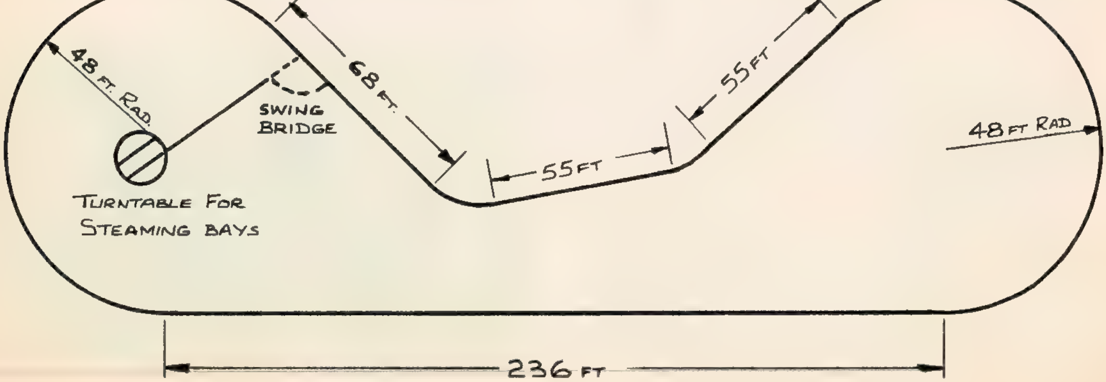
It was originally intended to bolt the A frames to the bases, but it was suggested this might be an unnecessary refinement and why not just use two reinforcement bars grouted into the holes and this proved to be quite O.K., a fillet being added after the A frames were in position. When thoroughly hardened, 6 in. x 1 in. planks were then bolted to the A frames. We expected a little trouble here but it was surprising how well these boards moulded themselves to the 48 ft. rads, with a little help from the heavy gang, of course. So far we've had no boomerangs taking off!

The tops of these boards were carefully checked for level and planed off where necessary, wooden sleepers then being nailed across at appropriate centres after being well soaked in creosote and oil. Track gauges were made up from round bar giving 5 in. and 3½ in. gauges fitting over the Ali Vignale section rail. We were fortunate in having purchased about 25 years ago enough of this Ali rail to give us about 700-odd feet run at these two gauges, for, if my memory serves me right, about £50. Quite a saving on present day prices. More has to be purchased of course as funds permit.

Rail joints are secured by flange plates screwed to double block sleepers and the rail is chaired down by heavy gauge wire staples bent to suit the rail section. Although the bending of these is inclined to be a little time consuming, it has proved to be well worth the effort as the finished appearance is most realistic. Time will tell whether these will stand the strain.

A special T-shaped track gauge was made to keep the gauge correct on the curves working on the outside 5 in. gauge, the 3½ in. then being set with the roller gauges. The swing section for access from the steaming bays made from wooden sections running on two rubber-tyred wheels, will have to be rebuilt as the weather has caused slight warping. The importance of this section obviously now calls for it to be made from metal — we live and learn — and one glaring fact has arisen from our efforts — you cannot cut corners. From this lesson we have built the turntable for the steaming bays of all-metal construction running on two grooved steel wheels located on a circle of angle iron which our sharp-eyed track superintendent "picked up" from somewhere!

The new track plan.



We had every hope of "joining up" in time for the traditional Boxing morning run but, unfortunately, we didn't quite make it in time.. However, considering the cold morning the turn out was quite good, and as usual the public turned out as well. The track seems to be standing up quite well to the running — running days are held whenever the opportunity arises, and judging by the number of people who turn up to watch and ride, the project is a great success.

Many times whilst working on Sunday mornings we are asked "Are you running this afternoon?" or "When is your next running day?" All very satisfying. Experiments are under way with electric colour signalling but as yet this is in its infancy.

Perhaps our Editor will allow us another progress report when we join up, and that long awaited opening day arrives. Who knows, we may even be lucky enough to see him and the rest of the fraternity who may care to "make the journey". It is hoped to add 2½ in. gauge at a later date when funds permit, and this should widen the interest.

"Laurie" Lawrence was present to witness the opening . . .

THE STAINES SOCIETY is only a small one but it has a big heart and has fulfilled a big ambition. Only two years ago they started building their first continuous track and had it in use by March this year. Formal opening was at the Spring Bank Holiday in hot and glorious sunshine and a very large crowd with plenty of support from their neighbour clubs attended. Chairman Ron Slade welcomed all the visitors and gave sincere thanks to those who had helped with the building of the track and he praised the Local Authority who had been very co-operative in the grant of land and working space for preparing the track parts.

The mayor breaks the tape to open the track.

As yet, there are no services laid on, water, etc. has to be brought to the track, but I feel sure that with the Society's drive and an understanding Local Authority, these should not be lacking for long. The track caters for 3½ in. and 5 in. gauges and is nearly 1000 ft. long and, being on the London outskirts, it should prove very popular.

John Phillips' L 90, an ex-G.W.R. 57XX 0-6-0PT in 5 in. gauge, was at the head of the inaugural train and the Mayor, with only the briefest instruction, boldly took the regulator and charged through the tape to declare the track officially open. A procession of locomotives in steam followed the inaugural train round the track and, a little later, the patiently waiting long line of youngsters were given rides.

Getting up steam before the crowd arrived.

Jim Rough's 5 in. gauge "Austerity" on the track.

Passenger hauling in progress.

'COUNTRYMAN'S STEAM'

A Single-cylinder Agricultural Traction Engine in 2 inch Scale

by John Haining

Part II *From page 1147*

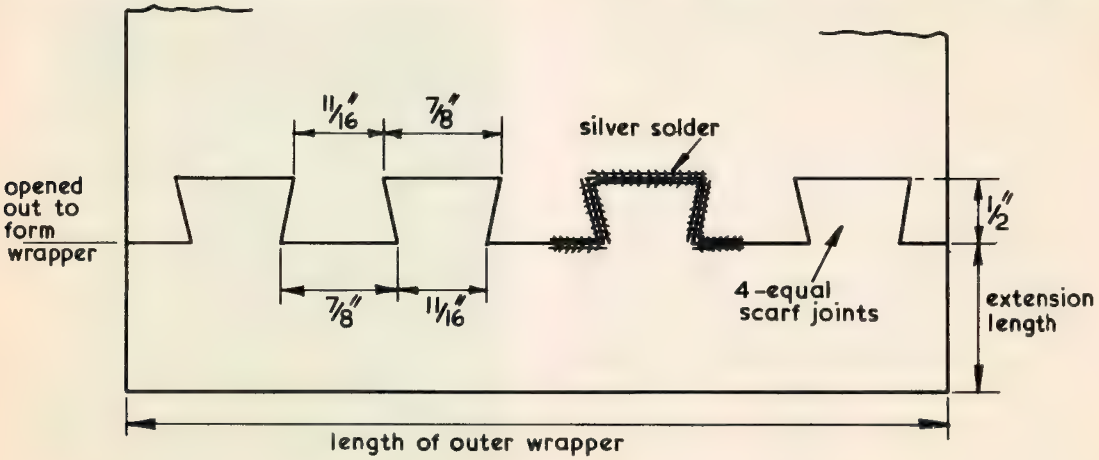
The Boiler

Contemporary notes referring to the boilers of the five engines built at North Bridge Engine Works by the Durham and North Yorkshire Steam Cultivation Company give the heating surface of the firebox and tubes as 135 sq. ft., with grate area of 5 sq. ft., and also state that longitudinal seams of the barrel were welded. Unfortunately it is not made clear as to the number and width of the barrel plate-rings, but these would probably have been about 4 ft. wide for a boiler of this length, with the longitudinal seams fire welded under the hammer, a practice used by several other traction engine makers in the manufacture of their inner fireboxes in the days before the introduction of gas or arc-welding.

As mentioned in Part I, a feature of these engines was the method of using separate hornplates bolted to the outside of the firebox outer wrapper plates instead of continuing upwards the wrapper plates to carry the crankshaft, as featured in Thomas Aveling's patent of 1870, and common practice ever since that date. Thus the boiler would appear, when naked and stripped of hornplates, very similar to the boilers of early Fowler 12 and 14 n.h.p. ploughing engines, which had heavy cast hornbrackets bolted directly to the boiler top without the planed and caulked joints necessary with integral hornplates.

No mention is made of a manhole position and none is shown on the nearside view of the engine. Although sometimes referred to as a manhole, this aperture in the boiler top or on either side, was really a hand-hole so placed as to enable the firebox top to be cleared of scale and mud, and many early makers preferred to do without this extra aperture in the boiler barrel, with its attendant riveted strengthening ring and heavy cover plate with two bridge-pieces — the well-known McNeil manhole, 11 by 14 in. Steel boilers and fireboxes had not come into use when this engine was built and in fact did not come into general use until after 1890, when boiler working pressures increased.

The Ripon engines were quoted as having boilers



ALTERNATIVE METHOD OF EXTENDING OUTER WRAPPER PLATE

Fig. 1

of Bowling iron, which probably accounts for their long working lives, as the old iron boilers, particularly those constructed of Low Moor or Staffordshire iron, were remarkable for their longevity, periods of fifty years or more being not uncommon for the life of boilers in districts where the water was good. In similar conditions, iron fireboxes have been known to last for twenty years or more instead of the usual ten to twelve years. The two small holes adjacent to the bottom edge of each hornplate (see illustration in Part I) were to clear the mudholes at each corner of the firebox water space. The curved cylinder base flange fitted directly to the boiler, being held in position by cone-neck bolts with the cone and neck inside the boiler shell, the crosshead guide bar bracket being secured in the same manner to the boiler shell.

Coming now to the boiler for the 2 in. scale engine, it will probably assist readers who may be considering building this engine if I first describe the boiler generally, following up with a list of material requirements and then a brief run through the constructional sequences, or at least some of them.

The boiler is 5 in. O.D. by 16¼ in. overall length and it should be noted that this latter dimension is from the front edge of the barrel to the back face of the backhead, which is shown on the drawing as being set out from the back edge of the barrel by 1/8 in., making the *actual* length of the barrel tube 16⅛ in.

The firebox gives a grate area of just over 18½ sq. in., and is surrounded by a water space 7/16 in. wide, with thirteen 1/2 in. O.D. tubes inclined 1/8 in. from the horizontal at the smokebox end; the fire hole ring being the one I have standardised for 2 in. scale boilers, with a generous firehole diameter making for much easier firing under running conditions and allowing the sleeve and door assembly to fit through the firehole without any need to attach the door hinge fittings and catch to the backhead.

Firebox side stays include hollow stays each side into which are screwed the setscrews attaching the hornplates to the boiler, and as the firebox has a rounded top, well radiused where it turns downwards to form the firebox sides, the screwed crown stays fitted to the full size boiler are omitted and replaced by the method shown on my drawing, with four lengths of 10 s.w.g. copper bent to form angle sections silver-soldered to the crown and joined by three transverse gusset plates forming a strong reinforcing section on the centre line of the crownplate — don't forget the holes through these plates, by the way, otherwise you will have a first-class mud-trap.

Three bronze longitudinal stays are fitted, and these may be either screwed 1/4 x 40 t.p.i. at the ends and fitted with blind ferrules screwed 3/8 x 40 t.p.i. into tubeplate and backhead, or well riveted over and silver-soldered over the ends as several builders of the Ransomes boiler have done.

Bushes for fittings are one for the turret and top water gauge connection on the backhead, one for a blowdown cock and one for the pump check valve on the nearside of the boiler. As far as can be ascertained, no injector was fitted on the full-size engine, but if anyone wants to fit one — I am going to — it can be fitted low down on the off side of the engine feeding to a second clack valve on the off side of the boiler, so a second bush should be included on that side; this can be plugged if no injector is fitted.

As on the Ransomes tractor, I have added the reinforcing plate for the cylinder mounting bronze setscrews or studs externally on the top of the boiler, where it is more easily riveted and silver-soldered in position, with a smaller one to support the crosshead guide bar bracket a little further back along the boiler top.

In diameter the boiler is similar to, but shorter than, the one I designed for the 2 in. scale Fowler class BB engine, with a generously long firebox to ensure free steaming, and anyone owning one of those boilers, superbly built by Alec Farmer away back in the 'sixties, will know why it has been possible to reduce the number of tubes down to 13 or even 12. With the bottom three tubes solid with ash towards the end of a day's running, steam production is still way ahead of demand even when working hard against the collar.

No rubbing plates are shown on the pictures of the prototype, and no brackets are required to carry a belly tank or the steering cross-shaft.

Extending the inner firebox below the foundation

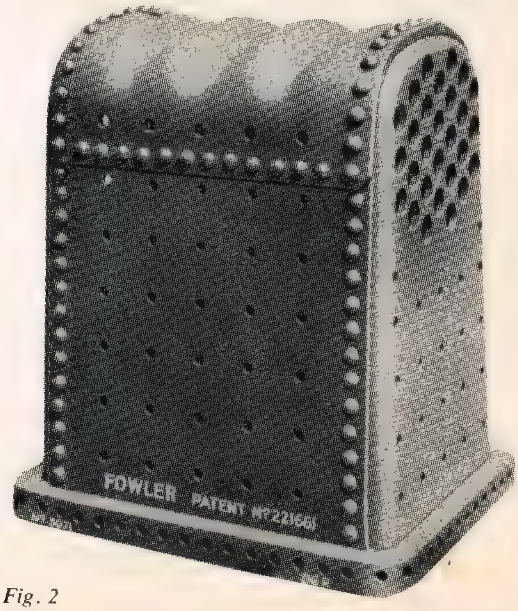
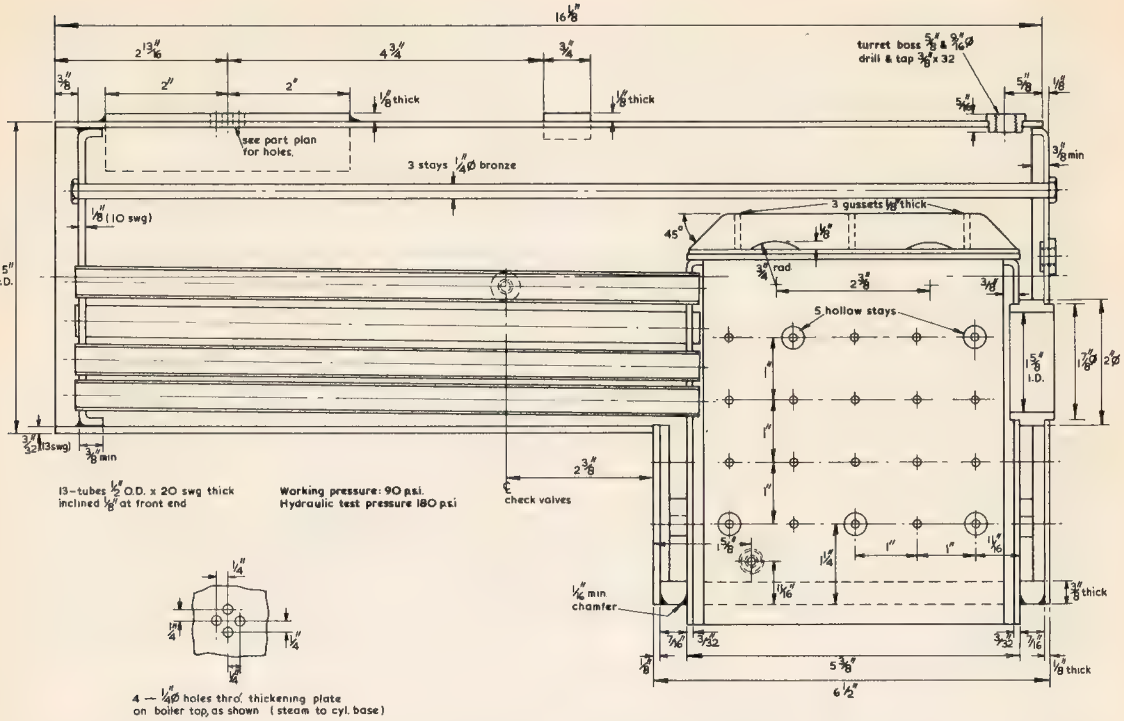


Fig. 2



ring facilitates attachment of the ashpan without having to drill the boiler for brackets, etc.; if a length of solid drawn copper tube is used for the barrel it will of course have to be extended, when opened out to form the outer firebox sides, by a strip attached as shown in Fig. 1 at the bottom of each straight portion. Personally I prefer to extend the firebox sides or wrapper by means of scarf joints, but many people use the alternate method, with a backing strip, as it is far less work — this is shown on the boiler drawing. If the sheet is rolled to form the barrel, similar remarks apply to the longitudinal joint below the barrel, which should be either scarfed or silver-soldered or brazed with a backing strip held in position by 3/32 in. dia. copper rivets *inside* the boiler.

Now to the material required — the first requirement being, I'm afraid, these expensive days, an understanding bank manager!

The boiler barrel is 5 in. O.D. 13 s.w.g. (3/32 in.) S.D. copper tube, the front tube plate 10 s.w.g. (1/8 in.) flanged from a plate 5⅝ in. minimum diameter. The throatplate, 5¾ in. by 5¼ in., and the backhead 8 in. by 5⅝ in. are both 10 s.w.g. thick and another piece of the same thickness 4⅜ in. by 4 in. is required for the cylinder thickening plate on top of the barrel.

The firebox is composed of a single plate forming the sides and crown, 14⅝ in. long by 5⅜ in. wide, with the firebox tubeplate and backplate flanged from 4⅝ in. by 6 3/16 in. plates, all 13 s.w.g. (3/32 in.). All these are, of course, copper, and in all probability some readers may wish to roll-up the firehole sleeve from a length of 10 s.w.g. sheet rather than machine one up as shown on the drawing — alternatively one may be obtained from trade, ready made, to silver-solder in position.

Tubes are all 1/2 in. by 20 s.w.g. thick and 10 3/16 in. in length and the foundation ring is 7/16 in. wide by 3/8 in. thick — a total length of 20¼ in., plus an allowance for cutting, being required.

There is one more requirement for 10 s.w.g. sheet, the four crown stays, bent to form angle lengths as shown on the drawing, and obtainable from a piece of 1/8 in. copper 5⅜ in. by 5 in. These can be made up from the same sheet from which the backhead and tubeplate are cut, with a bit of jig-saw work, and the gussets between the stays may be just obtainable from "corner-pieces".

I have given plate sizes for guidance in assessing the material requirements, but some readers may like to include a little bit extra for flanging while others require the minimum for trimming and cleaning-up the flanged edges.

The three longitudinal stays are 1/4 in. dia. bronze bar, as I have already mentioned, and the bars supplied under the trade name of HIDUREL 5 or 6 are ideal, as these, in the sizes required for this boiler have a strength in tension of 42-52 and 28-34 tons per square inch and are suitable for longitudinal and firebox stays.

The various bosses can be turned from brass bar, but beware of using too soft a variety as this can result in stripped threads if you have to remove and replace boiler fittings several times, and brass is absolutely out for use as stays, anywhere.

The construction of the boiler should follow the usual sequence, described in detail in my book *Model Boilers for Road and Ploughing Engines* which is due to be reprinted in enlarged form very shortly, but here are a few reminders: drill the shell, after squaring off the ends of the tube and slitting as far as the centreline to open out and form the outer wrapper, for the steam outlets to the cylinders and for the various bushes. Bring the outer wrapper up to the correct depth each side by attaching the extension strips, and attach the cylinder thickening plate by means of four 3/32 in. dia. copper rivets with heads inside the boiler and the holes in the plate countersunk so that rivets do not stand proud.

It is easier to drill the four 1/4 in. dia. steam outlet holes after the thickening plate has been attached to the boiler as this saves having to line up the holes in boiler shell and plate if these have been separately drilled.

After flanging the smokebox tubeplate on a steel former, clean up to a tight fit in the boiler after trimming off the rough edges, and jig drill and ream the 13 holes for the tubes — not forgetting that these are included, and rise 1/8 in. at the front end.

Slightly countersink on the outside to assist in forming a fillet on assembly.

Drill and tap the three holes for the stays, if you are going to use 3/8 in. by 40 blind nipples, or drill and very slightly countersink if you intend to rivet over and silver-solder the stay ends.

The backhead will require drilling, after flanging, for the single water gauge bush, and in similar fashion as the front tubeplate for the longitudinal stays.

Mark out, drill and tap 4 BA for the 6 screwed stays and then trepan the hole for the firehole sleeve, which should be a tight fit in the plate, through which it should project at least 1/32 in.

The throatplate will only require drilling and tapping for 6 stays screwed 4 BA; as no steerage brackets attach to the plate itself, the hornplate having extensions at the front to carry the steerage cross-shaft. The firebox, made up of a single plate forming sides and crown, and two end plates, can be made up as a complete unit with crown stays riveted in position with eight 3/32 in. copper rivets prior to silver-soldering. The firebox tubeplate should be jig drilled to take the tubes, and slightly countersunk on the inner side around the tube ends, as on the smokebox tubeplate.

Assemble and silver-solder the firebox, with firehole sleeve or ring inserted and slightly peened over where it fits through the plate. Insert the tubes into the tubeplate and line up with the smokebox tubeplate, and silver-solder into position, completing the firebox and tube assembly. Next, insert the firebox into the boiler and secure the firebox tubeplate to the throatplate with three 3/32 in. copper rivets through plates and the front length of the foundation ring. Insert the smokebox tubeplate into the boiler shell — this should line up if checked before assembly with the tubes — and silver-solder the tubeplate flange into the boiler shell and next, the tubes into the tubeplate.

Insert the already flanged backhead into the wrapper plate and over the firehole ring spigot, making sure that the wrapper fits closely to the backhead flange and that the firehole ring is peened over where it projects through the backhead.

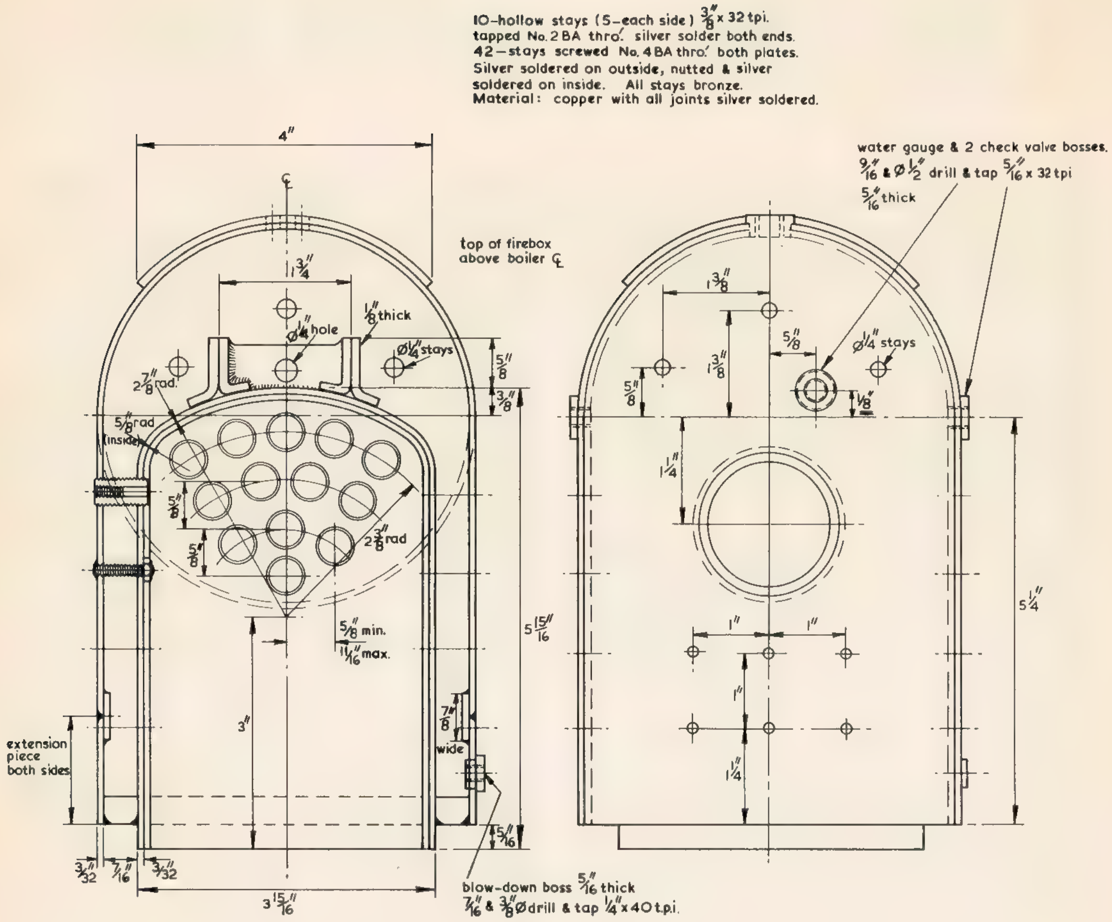
Fit the remaining three lengths of foundation ring, making sure again that they are a close fit all round, and securing them with three 3/32 in. copper rivets per length; silver-solder the backhead into the wrapper, the foundation ring lengths, longitudinal stays and the various bushes into their respective holes, before screwing in the side and end stays and silver-soldering over the heads and the nuts inside the firebox.

Screw the screwed hollow stays tightly home before silver-soldering. The spare length used for gripping the stay should be cut off or ground to leave a projection of not less than 1/16 in. or not more than 3/32 in. outside the wrapper; obviously all five hollow stays must project uniformly each side to allow the horn plates to sit correctly, square to each other and the boiler centreline.

The foundation ring should be chamfered at least 1/16 in. at 45 deg. to allow a first-class joint, as in a boiler without crownstays the foundation ring has to resist boiler pressure without any assistance whatsoever from any stays running from firebox crown to the top of the wrapper.

Notwithstanding this, a number of engine makers later abandoned screwed crown stays in favour of other methods of supporting the crown or roof as it was often called. Fowlers of Leeds, for example, used a slightly radiused firebox crown with four double girder stays secured by studs and bridge pieces to the top, at the same time manufacturing a neat patent corrugated firebox (see Fig. 2) which they fitted on many of their rollers and engines.

Aveling and Porter, away down in Rochester and later at Grantham, also used a corrugated firebox, while Marshalls of Gainsborough favoured a corrugated firebox crown with a cross-shaped indentation on their "S" series boilers, and the famous high-pressure boilers designed and built by the Oxford Steam Ploughing Co. of Cowley (later styled John Allen and Sons Ltd.) for their own and a host of customers' rebuilt ploughing engines, all had *flat* firebox tops with five massive bridge stays



each secured to the plate by five 7/8 in. dia. studs nutted at both ends.

In all these examples the single row of long rivets securing the foundation ring between firebox and wrapper, backhead and throatplate took the load in double-shear, and a silver-soldered or otherwise fabricated foundation ring must perform the same function under similar circumstances and in whatever state.

The boiler may be constructed by the alternative method of rolling the barrel from a flat sheet of copper, with a longitudinal seam below, and joining the separate firebox outer wrapper to the barrel by means of a 'piston-ring' joint inside both barrel and wrapper. This method does away with the need for extending the bottom of the wrapper each side, but calls for really first-class workmanship in making the joint between barrel and wrapper, especially as a traction engine boiler is unsupported by frame members and consequently is subjected to considerable external as well as the normal internal stresses, even in 2 in. scale.

For new arrivals on the model engineering scene, and with apologies to the old hands — do anneal each length of copper sheet well before you start to work it over the flanging former, and keep on annealing as often as is necessary.

Easyflo No. 2 silver-solder is recommended for use throughout the entire construction of the boiler. In the next article, I hope to cover some of the platework, including smokebox and the rather unusual hornplate and crossplates, and this reminds me to suggest that, before even opening out the copper boiler tube to form the wrapper, scribe the centreline clearly along the top of the barrel; this will prove invaluable later when you come to set the engine up and mount the cylinder casting.

To be continued

Club Chat... with the Editor

The club post recently appears to have been made up mainly of winter programmes, which is hardly surprising. This does not apply, of course, to our friends in southern climes where presumably they are working out the summer season's events. As well as giving us the winter programme, **Dublin S.M.E.E. Ltd.** has asked us to jog the memories of readers in that area by reminding them of the secretary's name and address. No sooner said than done, it is Mr. H. R. Mapother of "Mendip", Greys Lane, Howth, Co. Dublin, Ireland. The telephone number is 322068. So come on all you readers in Ireland who are just contemplating joining this club. By taking advantage of membership you will benefit from a multi-gauge track which hopefully will be constructed soon on an old estate by kind permission of the county council. The events will appear in due course in our "Club Diary" so you can see what's going on.

Another winter programme has appeared from **Guildford M.E.S.** but as it continues well into next year it looks as though the committee has been busy. The AGM, I see, is on 21 March. The club, of course, is justifiably congratulating itself on a busy though very successful season which saw the IMLEC event and their own Model Engineering Exhibition and Traction Engine Rally. I don't think anyone can dispute the high standard of these events and I would like to add my congratulations to those already received. This club made many friends at Leek last May and as a result will stage another International event in 1980 when many overseas visitors will be entertained with their models for the ten days leading up to Guildford's Model Engineering Exhibition.

John G. Dowdeswell, Chairman of the **Society of Model and Experimental Engineers,** has written to tell me about the winter activities of S.M.E.E. and to encourage loners and new members to come along. Meetings are held on alternate Saturday afternoons and, of course, the well-equipped workshops and library are open on Tuesday, Thursday and Saturday evenings. Both S.M.E.E. and *Model Engineer* are celebrating their 80th anniversaries this year and I am sure this will be reflected in the annual dinner which takes place this month. If you are not already a member, then Arthur Smith is the Hon. Sec. and he can be found at Marshall House, 28 Wanless Road, SE24. Telephone number is 01-674 5317. This address is, of course, that of S.M.E.E.

Norwich and District S.M.E. have had a busy close to the running season with an Invitation Day on 1 October, Bring and Buy sale on 11 October and a visit to the 1st Midlands Model Engineering Exhibition on 23 October. Future meetings are planned for 8 November, 22 November for a visit to Cowell Engineering Ltd. and a slide show on 13 December. Despite the apparent lower numbers of locos available, this year saw the second highest number of passengers carried ever. 1974 was the highest but that was the year that the track was enlarged.

Wigan & District M.E.S. had good weather for their trip from Haverthwaite to Windermere on 20 August and the following day had a good turn-out for a bits and pieces night. One of those demonstrating models was Cyril Abbots who in the past seven years has built a 3/4 in. scale Burrell T.E., Martin Evans's "Rob Roy", and is currently engaged on another project. Geoff Buckley brought along an LBSC Duplex Pump and John Hartup talked about his 5 in. gauge model of a Kerr Stuart Meyer 3 ft. 6 in. loco which was delivered to the Anglo-Chilean Nitrate Railway Co. in 1903.

We don't hear a great deal about gauge "O" in these pages but here's a meeting on 10 December which could interest our smaller gauge enthusiasts. It is a joint venture by the **Gauge "O" Guild** and the **Derby Gauge "O" Group.** It is to be held in Queen's Hall, London Road, Derby, from 13.00 until 18.00 and will comprise running tracks, layouts, static events and trade stands. Prospective members are most welcome. While we are on the subject of the smaller gauges, I must mention that I was very pleased to hear from Mrs. Isabella Roberts (Ella to gauge "1" enthusiasts). She is, of course, the Hon. Treasurer of the **Gauge "1" Association,** and husband Stan is Secretary. The few words I mentioned in "Club Chat" several issues ago have increased the membership by a few more, which is very gratifying. Ella expressed a slight concern that in the past there have been one or two indications that these smaller gauges were not really considered to be model engineering. I am sure that I speak for the vast majority of *M.E.*'s readers when I say that this is far from being the present case. It is true that most *M.E.* clubs have 3½/5/7¼ in. tracks and the gauge "1" is perhaps more specialised. But that does not mean that the effort involved in the construction of a loco in this gauge is any the less model engineering although I have heard such terms as watchmaking used on occasions. I would like to think that these pages are meant for model engineering enthusiasts whatever size of model they happen to prefer. And if the smaller gauge followers feel that there is any way in which the contents do tend to overlook them then I hope they will let me know. You can pass that on to your members, Ella.

Talking about gauge "1" reminds me of the remark I made about finishing my "Green Arrow". That in turn reminds me about evening classes, which is where all this concerted effort is taking place. Those of you who haven't bothered to enrol this year can take it from me that you are missing out if my college is anything to go by. It isn't just the equipment which is of benefit although standing at a bench did bring back a few memories, I can tell you. It is the close proximity of other chaps all doing what they have chosen to do and at this stage there are a few who have not yet decided. So there is plenty to talk about and it's a wonder sometimes that progress is made. But it is and can be seen at the end of the evening when you pack up.

A few issues ago I published a small complaint by Mr. John Bond of the **North Wilts. M.E.S.** who said that "Club Chat" did not go far enough in its remarks about the clubs. Mr. Bond felt that information as to who has what, where and when, would be well received. As a result I heard from Brian Thompson, who is the Handbook Editor of the **Southern Federation of M.E.S.,** and who told me that the Federation is in the process of doing just that for all its affiliated clubs. It is hoped that a handbook will be produced in time for the M.E. Exhibition and which will contain all relevant details of member clubs, which is exactly what Mr. Bond wanted. To keep costs down, advertising space is being sold and the result should be very pleasing. There are over 80 member clubs and the total number of members is

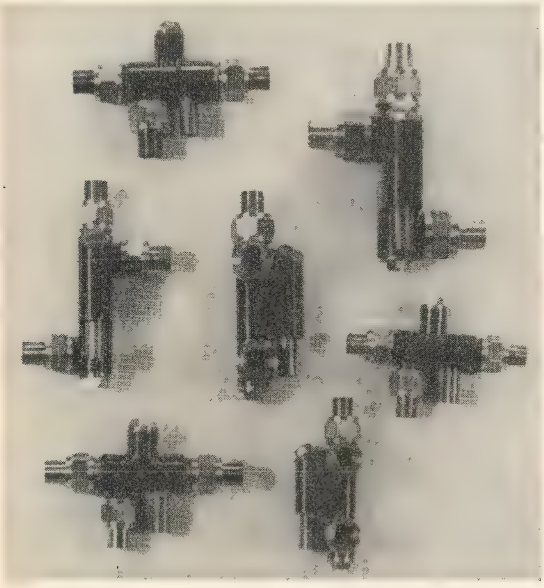
about 4000, not only in this country but also in America, Australia, France, Germany and Holland. So this will be another benefit to be gained by being affiliated to the Southern Federation.

In the past few months, **British Columbia S.M.E.** has lost two prominent members, Frank Swinton and Len Love. Frank was 93 when he died and nearly 50 years of those were devoted to membership of the B.C.S.M.E. and its predecessor, Vancouver S.M.E. He originated from Lancashire but went to Boston, Mass. in 1910 and eventually reached Vancouver in 1929 when within a short time he had joined the local club and started "Austere Ada". Apart from building several models, he also operated the steam train in Stanley Park. Len joined the B.C.S.M.E. in 1970, was treasurer among other things and liked to be in on all the club activities. He attended the club's 50th anniversary celebrations on 2 July although he was confined to a wheelchair, and was known to have enjoyed the event immensely. He passed away the same evening.

A stop press piece of news concerns the **Sheppey Miniature Engineering and Model Society** to which I referred a few issues back. At the time I had no telephone number for the Hon. Sec. but I have just heard from the club to the effect that this gentleman is Martin Breakspear whose telephone number is Minster (Sheppey) 874688. The chairman is John Wheeler (Minster 874149), and the treasurer Selwyn Probert (Sheerness 4220). Being a new club the usual problems of what to do and where to go have arisen, but half the fun of club membership is derived from these discussions. Most of Sheppey's members also attend the evening classes on Tuesdays so the club meetings take place in the school on the first Tuesday in every month.

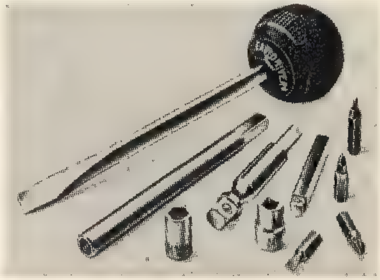
WHAT'S IN STORE

Where possible, the items reviewed are seen and tested by "M.E." staff. However, where this is not possible reviews are given solely on the information received from the manufacturers and we cannot accept responsibility for products which do not measure up to the claims made for them.



Horizontal and vertical injectors
A few issues ago we published details of Don English Jubilee horizontal injectors currently available from Blackgates Engineering. Don Young, who is, of course, well-known for his loco designs and accessories, has recently sent us samples of his Gordon Chiverton horizontal and vertical injectors which are designed for ease of installation avoiding the need for sharp bends in the pipework. These injectors are for locos or traction engines and the variations in design permit the most suitable one to be chosen to suit the installation. Sizes at present available give capacities of 12, 16, 24, 40 and 60 oz/min. and there are two pressure ranges, up to 95 p.s.i.g. and 130 p.s.i.g. There is a total of 50 variants so you should be able to find one to suit. We had no need to test these injectors, Laurie Lawrence, who is accepted as an expert in such matters, has given them a most definite O.K. As a matter of interest, Don Young has had his injectors field tested in Australia, Canada, France, W. Germany, Japan, New Zealand, South Africa and the U.S.A., so that should help our readers in those countries.

Ratchet tools
Here's a useful little set of tools which we have all wished for at some time or another. It hails from Omark U.K., 6 Station Drive, Bredon, Tewkesbury, Glos., and is called the Easydriver. The ball is a ratchet driver designed to give a comfortable grip and maximum turn, and it has a socket at each end for attachments. The latter comprise screwdrivers, these being slotted, Philips, Pozidriv, etc. of differing sizes, sockets for nuts, bits for Allen screws, etc. The Easydriver comes in several kit forms according to the use to which you intend to put it. Although we have not seen the actual tool, it sounds extremely useful but we would suggest that when in use the socket at the end opposite that being used remains empty. It brings back painful memories of leaning heavily against a sticking door from which the key was still protruding.



Epoxy resins
Usually, these resins are only available in quantities uneconomic to the model engineer and consequently their use as adhesives, castings, coatings, repair, etc. is generally denied us. Now the Epicentre at 49 Heathfield Road, Bury, Lancs. is offering several of these products in small amounts. They are: slow setting adhesive; slightly faster setting adhesive; medium fast setting adhesive; G.P. knifing putty; dense knifing putty; hard knifing putty; wood repair compound; fillers for epoxy/polyester resins; Dolomit; and Talc. Other products will be available shortly. Mr. D. F. Exley, the proprietor of Epicentre, tells us that they will be moving shortly to 22 Hamilton Road, Whitefield, Manchester, but for the time being it is best to use the Bury address. Quantities available range from ¾ kg up to 7½ kg and to take advantage of the competitiveness of the prices it is better to send cash in advance — the surcharge of invoicing defeats the object. The telephone number for evenings only is 061 796 9805. A useful set of instructions is included and a full list of materials, quantities and prices is available on request.

Post Bag

The Editor welcomes letters for these columns. Pictures, especially of models, are also welcomed. Letters may be condensed or edited.

IMLEC

SIR,—May I be permitted to comment on the remarks made by Rev. Gibson in his letter published in the *ME* for 1-14 September.

I was involved with IMLEC at its inception and must take much of the blame for suggesting the use of a Dynamometer Car to establish "work done" rather than relying on the weight times distance approach advocated by Rev. Gibson.

The Birmingham Society of Model Engineers had run such trials as a club event for several years at the old Campbell Green track, and had also joined with other societies to run inter-club events. Different trucks and tracks produced very different results.

By the time discussions were taking place for the first IMLEC our appetites had been whetted by the Rugby Society who had by then experimented with a dynamometer car with successful results. It was agreed to build a car specifically for IMLEC, and as this was fully described in the *ME*s 21 November - 18 December 1969 it is sufficient to point out that it is fitted with an integrator which provides a record of the total work done in foot pounds by simply taking the difference between the counter readings before and after the run.

Any spot readings taken by the observer merely serve to indicate variations throughout the run and provide additional information when analysing the results as the car isn't fitted with a continuous chart recorder. The spot readings can also serve to check the correct functioning of the integrator. They are not normally used for calculating the results of the competition, and I understand that none were taken this year at Guildford.

Tests of the rolling resistance of passenger cars, using the dynamometer car, have confirmed suspicions of the inadequacy of weight times distance as a measure of work done when applied to locomotive testing.

We found differences in the resistance of apparently identical cars, that the resistance varied with speed and rail conditions, and perhaps most important, that it did not vary in direct proportion to the load on the car.

Regarding the accuracy of the B.S.M.E. Dynamometer car, used at the majority of IMLEC to date, we aimed at a tolerance of within plus or minus one per cent, and such dynamic tests that we have made suggest that no significant error exists. The Bristol Society have tested it coupled to their own car and reported good correlation.

As to IMLEC itself, it must be remembered that it is a competition and that awards are made for the best results achieved on the day, under the rules and conditions prevailing, just as in any other competitive event. It does not pretend to test a loco fully, as this would require several runs with different loads and speeds with very carefully controlled stabilised rates of firing. This is hardly possible in a single half-hour run on an unfamiliar track, usually without the opportunity for a pre-competition run to learn the road and get used to the coal.

Mr. Cox's quoted remarks from his book *Chronicles of Steam* are of course valid. He does not however advocate "Ton Miles" as a better basis of measuring work done when testing the efficiency of locomotives.

One major drawback in the use of the dynamometer car for our trials is the vital necessity of ensuring that the only connection between the loco and the car is via the drawbar. The momentary contact by drivers while firing or adjusting controls has little effect, but more lengthy periods of contact by the driver leaning on the tender, or by resting a steadying hand on a bunker of tank engines, can influence the readings, favourably or otherwise according to the direction of the applied pressure and one's point of view.

In view of this problem a number of arm rests of varying heights are provided to be fixed to the front of the dynamometer car as required where the driver has difficulty in reaching the controls without resting his weight on something. The use of these rests has been conspicuous by its absence, most drivers preferring to manage without. Drivers are made aware of the need to minimise contact in this way and stewards watch out for any breach of this trust, inadvertent or otherwise.

The cover picture of the issue dated 1-14 September is thought-provoking in this respect though a photograph is only a record of a fleeting moment in time.

It really is a great pity that the Rev. Gibson has chosen to raise the question of Mr. Haines's disqualification again after such a long time and I agree wholeheartedly with Martin Evans' comments. The judges had an unenviable job on this occasion. I do not wish to comment further on this aspect of his letter except to assure him that the dynamometer is sufficiently damped to prevent it going "haywire" due to any unevenness in the pull from the locomotive.

Just to answer one last point, if it is necessary to cope with drawbar pull in excess of 60 pounds, surely the simple remedy is to fit a stronger spring, as the Guildford lads did this year, rather than decry the principle.

I would like to thank all those who work so hard each year to make IMLEC a continuing success and such an enjoyable occasion, and hope to see it continue for many years more in its present form. I would, however, close with a suggestion which may not suit the purists but would remove one point of contention, namely the provision of coal.

The majority of good coals used by small locomotives have similar calorific values but do vary greatly in the amount of draught required and usually a loco gets tuned up to suit the coal normally used by the home club.

If competitors were allowed to use their own coal, it would eliminate problems arising out of the use of unfamiliar coal, and possibly improve the general standard of running. Many competitors travel a very long way to compete and I feel it is a pity if the run is marred merely by unfamiliar coal.

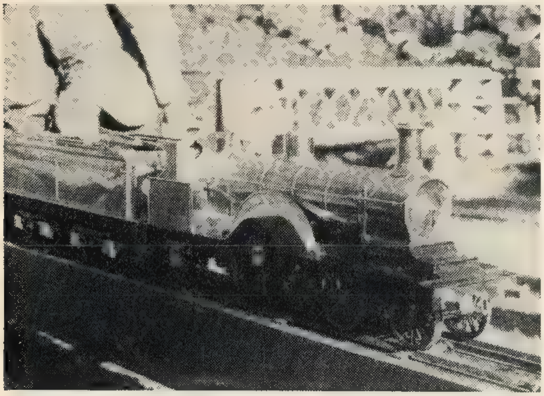
Rednal, Birmingham — Brian G. Hughes

Reader's models

SIR, — After taking a few pictures of my workshop and models, I thought you might be interested in looking them over. *Rob Roy* was my first attempt in the late 60s. Since then I have built the Quorn tool grinder which lives on my marking out table. It was made from a piece of plate glass 32 in. x 27 in. x 1 in. thick mounted in an aluminium 2 in. angle frame, 42 in. high so that you don't have to squat to read rule measurements. Behind that, fastened to the concrete wall, are a lot of small drawers, some I purchased and some made with plywood frame, tin plate drawers with plexiglass fronts.

Princess of Wales won for me 1st prize at the Pacific

National Exhibition here in Vancouver. I didn't notice until after the photos were developed that the floor in the cab was not pushed down on to the frame at the right hand side. The photograph was taken at the Victoria Model Engineers track. In the background you can see a wood girder bridge and the start of a trestle of wood. I am



still undecided whether to paint it or leave it, as everyone says it is a shame to cover up all that brass, the tender is 16 g. and the lagging is 10 thou shim stock. I was a sheet metal worker before I retired seven years ago. My workshop is in the basement and the hot water heating keeps it at a nice even 65 per cent, 68°F.

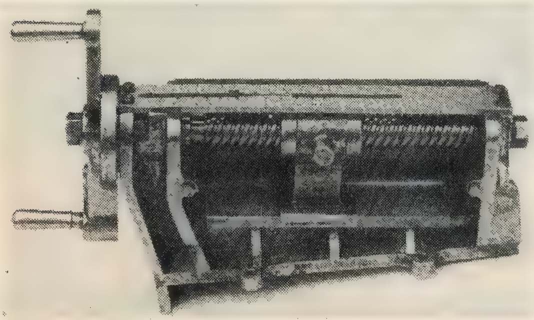
I have a Super Seven Myford and Harrison with all accessories, collets up to 1 in., vertical slide, taper turning attachment, 19 in. face plate, micro carriage stop, boring table, a real lovely lathe, a Harrison Horizontal mill with vertical attachment, also a Chinese vertical mill which I use as a drill press, also oxygen and acetylene welding equipment, 14 in. wood band saw on which I put a reduction gear and can cut steel 2 in. thick if necessary, an Arbor Press and a 10 in. wood table saw, also a 4½ cu.tt. compressor. I covered most of the two walls with peg board which is very useful.

I bought castings and boiler material for Highlander about three years ago and have started work on it so far constructing the frame and smoke box. I also have designed an erection rig which can lift the loco from the floor to any height even above my head and revolve it about its longitudinal axis and back in any position. I have a movable steel table that goes under the loco to hold tools etc.

Vancouver, Canada. G. E. Thornton

G.W.R. Constructional Details

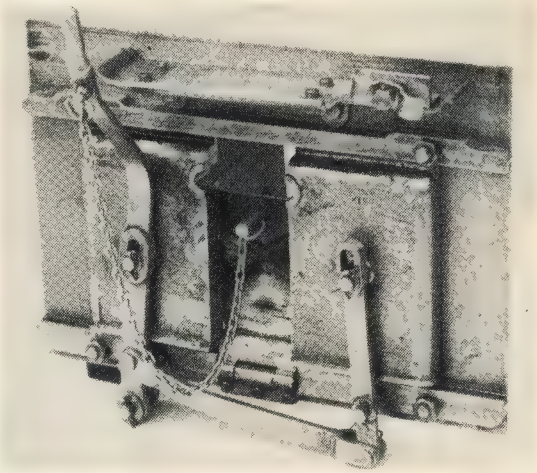
SIR,—I enclose some photographs of "Fairground Engineering" which may be of interest to some readers, if not Mr. Thomas. They are components for a 7¼ in. gauge



G.W.R. 0-4-2 No. 1450 which I have under construction.

The reversing screw has a 4-start thread with a separate gunmetal nut in the slide. The body is a fabrication of 15 pieces silver soldered together. The handle contains the latch, a dovetail slide operated by a ball catch. The latch engages with a notched disc fitted to the body. The indicator plate in the top was "engraved" with punches held in a guide in the lathe chuck with the blank clamped to the cross-slide. The positions of the graduations were measured on the full-size engine and set out using the cross-slide and lead-screw indexes.

The valve gear and ports, etc. are all scaled from the works drawing of the engine so the cut-off percentages should be as correct as big sister. It is interesting to note that when you are building an actual engine, i.e. 1450 and you have that engine available for reference, you realise that the works "General Arrangement" is of very limited use. It tells you virtually nothing when you actually compare it with the engine, and by compare I mean get your overalls on and get up inside the frame and in the smokebox.



I was lucky to be able to borrow a drawing of the firehole doors. They are hollow and correctly ported for top air as the originals. The air-plate and oil tray are pressings. The bracket at the end of the oil-tray is a parking clip for the auto-gear linkage to the regulator handle. Yes, it is fitted with auto-gear and someone has already suggested that it is no good without the coach to go with it.

Cavenham, Reading. Ian R. Holder

Winding Flexible Steel Cable

SIR,—Ron Warren's "A Question of Transport" (*M.E.* 16 December '77) was both interesting and well illustrated. He is obviously well versed in the basic principles of the project.

One practical detail worries me however. I refer to the association of the "Flexible Steel Cable" and a "Winding Shaft" of 1½ in. dia.

My experience suggests that the cable will, before long, begin to break up where it passes over the 1½ in. diameter shaft. In fact 4 in. is the minimum diameter around which I would consider it safe to wrap a ¼ in. flexible steel cable such as I imagine is being used.

Also I suggest that a cable break will occur first at the layshaft for the reason that this is the point of least wrap and therefore least restraint to slide sideways. During operation there is also a tendency for the cables to slide sideways at this point. Another important consideration is that the very place where cable break-up is most likely to

occur is completely hidden from view, so that continuous inspection will be almost impossible.

I am sure Mr. Warren realises as well as anybody that there are "more ways of killing the cat than drowning it" and therefore a way of avoiding the problem raised can be found.

The thought of the trailer one day dropping its precious cargo causes me as much anguish as I have no doubt it does Mr. Warren.

St. Albans. R. E. Bennet

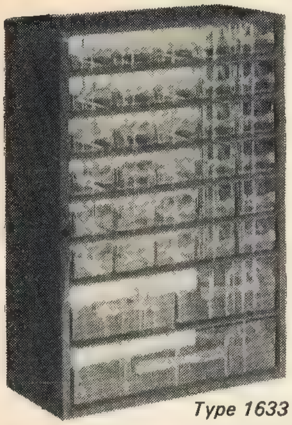
Mr. Warren's reply follows in the next issue.

Raglan Lathes

SIR,—Re query from correspondent Kenneth Walton *M.E.* 3577. It may not be generally known that the "Raglan Engr. Co." of Nottingham, makers of the "Little John" and the later "Raglan 5 in." were taken over by Messrs. Myford of Beeston, Notts, a few years ago, and although this lathe which had much to commend it was taken out of production as a result, Myford can still supply some spares. Whether this is true of the older "Little John" I do not know, but may be worth an enquiry. Hope this may be of some help.

Stoke Bardolph, Nottingham. R. A. Limb.

Storage Cabinets



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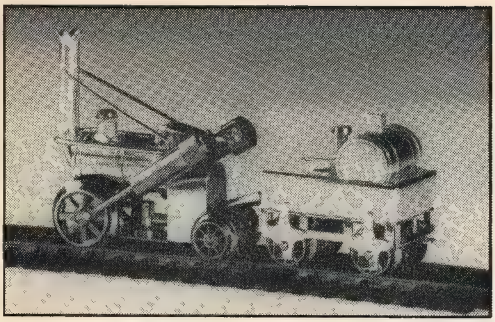

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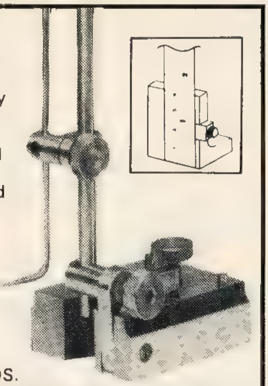

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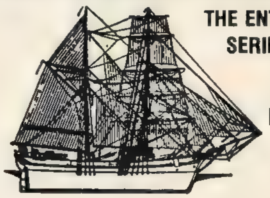

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